NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL PROJECT

A CASE STUDY OF THE U.S. NAVY'S MESS BILL COLLECTION PROCESS FOR OFFICERS ON BOARD NAVY SHIPS

June 2018

By: **Kathryn M. Damore**
Paul C. Damore
Kenneth D. Swing

Advisors: **Spencer T. Brien**
Bryan J. Hudgens

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE June 2018	3. REPORT TYPE AND DATES COVERED MBA Professional Project	
4. TITLE AND SUBTITLE A CASE STUDY OF THE U.S. NAVY'S MESS BILL COLLECTION PROCESS FOR OFFICERS ON BOARD NAVY SHIPS			**5. FUNDING NUMBERS**
6. AUTHOR(S) Kathryn M. Damore, Paul C. Damore, and Kenneth D. Swing			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.	12b. DISTRIBUTION CODE A

13. ABSTRACT (maximum 200 words)

    The purpose of this project is to determine whether the current policy dictating the officer mess bill collection process on ships is efficient and cost effective, or whether the policy requires modification to reduce costs and improve efficiency. To assess the effectiveness of the current policy and process, this study drew from interviews conducted with members involved in the mess bill collection process on board a U.S. Navy aircraft carrier. The interviews focused on gathering information about the entire cycle of the mess bill collection process and the amount of time, in hours, required to complete the process every month. In developing models to analyze the data collected and running simulations of these models, we developed estimates for man-hours and labor costs to administer the process both inport and underway. The findings indicated high man-hour and labor costs for the Navy, suggesting inefficiency in the current policy and process. These results suggest the need to modify policy and to update the process for the Navy of the 21st century to enhance efficiency and reduce costs. Further research is needed to more accurately estimate costs for mess bill collection throughout the Navy, as well as additional administrative costs associated with the process off ships.

14. SUBJECT TERMS mess bill, mess bill process, mess bill collection, basic allowance for subsistence, BAS, Supply Corps, supply officer, Navy, aircraft carrier, wardroom officer	**15. NUMBER OF PAGES** 99
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

A CASE STUDY OF THE U.S. NAVY'S MESS BILL COLLECTION PROCESS FOR OFFICERS ON BOARD NAVY SHIPS

Kathryn M. Damore, Lieutenant Commander, United States Navy
Paul C. Damore, Lieutenant, United States Navy
Kenneth D. Swing, Lieutenant, United States Navy

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

**NAVAL POSTGRADUATE SCHOOL
June 2018**

Approved by: Spencer T. Brien
Advisor

Bryan J. Hudgens
Co-Advisor

Rene G. Rendon
Aruna U. Apte
Don E. Summers
Academic Associates
Graduate School of Business and Public Policy

iii

THIS PAGE INTENTIONALLY LEFT BLANK

A CASE STUDY OF THE U.S. NAVY'S MESS BILL COLLECTION PROCESS FOR OFFICERS ON BOARD NAVY SHIPS

ABSTRACT

The purpose of this project is to determine whether the current policy dictating the officer mess bill collection process on ships is efficient and cost effective, or whether the policy requires modification to reduce costs and improve efficiency. To assess the effectiveness of the current policy and process, this study drew from interviews conducted with members involved in the mess bill collection process on board a U.S. Navy aircraft carrier. The interviews focused on gathering information about the entire cycle of the mess bill collection process and the amount of time, in hours, required to complete the process every month. In developing models to analyze the data collected and running simulations of these models, we developed estimates for man-hours and labor costs to administer the process both inport and underway. The findings indicated high man-hour and labor costs for the Navy, suggesting inefficiency in the current policy and process. These results suggest the need to modify policy and to update the process for the Navy of the 21st century to enhance efficiency and reduce costs. Further research is needed to more accurately estimate costs for mess bill collection throughout the Navy, as well as additional administrative costs associated with the process off ships.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

BAS	Basic Allowance for Subsistence
CAPT	Captain
CDR	Commander
CNAFINST	Command, Naval Air Forces Instruction
CPO	Chief Petty Officer
CVN	Aircraft Carrier (Nuclear)
CVW	Carrier Air Wing
DESRON	Destroyer Squadron
DFAS	Defense Finance and Accounting Service
DoD	Department of Defense
FSM	Food Service Management
FSO	Food Service Officer
LT	Lieutenant
LTJG	Lieutenant Junior Grade
NAVSUP	Naval Supply Systems Command
NSCM	Navy Standard Core Menu
PO5	Petty Officer Second Class
RIK	Rations-In-Kind
RMC	Regular Military Compensation
S-2	Food Service Division
S-5	Wardroom Division
TYCOM	Type Commander
U.S.C.	United States Code
USDA	United States Department of Agriculture
XO	Executive Officer

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

With the advent of new technologies, ship design changes, public perception, and cultural changes, the current process for determining officer Basic Allowance for Subsistence (BAS) and the subsequent process to collect mess bills at sea needs reevaluation. Officers receive a smaller BAS than enlisted personnel and must pay every month for all meals eaten while on board via a shipboard debit card called a Navy Cash Card. The wardroom officer must collect and track all payments internally. Enlisted personnel serving on board ships receive BAS and have 30 days of meals at the discounted rate collected electronically via mandatory pay account collection (Department of Defense [DoD], 2016). Essentially, the Navy automatically deducts all meals from enlisted paychecks, and BAS covers the entire cost of their meals. On the other hand, officers are paid less in BAS and must pay for all meals eaten every month via an internal mess bill collection process.

The dynamic and time-consuming process of paying, tracking, collecting, and managing the officer mess bill on board ships limits the amount of time officers can spend managing their departments and divisions. The process also places an undue burden on those intimately involved in the process, to include the wardroom (S-5) records keeper, wardroom officer, disbursing officer, and others. The current collection process not only increases the risk of human error, but also seems to be far less efficient than that of the mandatory pay account collection currently used for enlisted personnel. Evaluation of the officer mess bill collection process and policy will determine the current estimated cost of administering the process. The analysis will indicate whether the current method and policy for mess bill collection is efficient and cost effective, or whether the policy needs further analysis and modification to reduce cost and improve efficiency.

A. PURPOSE OF STUDY

The purpose of this project is to evaluate the process and the policy governing mess bill collection for officers on board ships. The evaluation was conducted using data collected from interviews with personnel involved in the process on board a U.S. Navy

aircraft carrier, as well as data from their onboard Food Service Management (FSM) system. The evaluation examined the existing policy and the process required to enact the policy in order to identify the current cost of administering the process and potential policy changes to improve cost and efficiency. By analyzing the evaluation, this thesis provides a basis to understand the current costs involved in the process in order to support the adoption of an updated policy for mess bill collection across the Navy.

B.   SCOPE AND LIMITATIONS

The scope of this project is limited to a single aircraft carrier and how it implemented the mess bill collection policy. However, using data procured from a U.S. Navy aircraft carrier (CVN) allows a detailed analysis of the largest and most complex officer mess bill collection operation in the Navy. Our interviews with four personnel intimately involved in collecting officer mess bills focused on the steps required for this process and the time each member spent on each step. Furthermore, we received data concerning this specific aircraft carrier's mess bill collection operation from the Type Commander (TYCOM) that oversees all ship food service operations on the coast. By examining in detail the experience of the largest ship class, we hope to identify issues that will inform future studies of this issue in other naval settings.

Some limitations of this project include time, size, and personnel. Due to publication time constraints, we only reviewed three months of data, and most of the data was from underway periods due to the selected CVN's schedule. Our study only includes one CVN, selected due to its size and complexity, with the assumption that the data collected will be representative of other vessels in the Navy in terms of its content, and should serve as an upper bound in terms of complexity. Our project also limited the number of personnel interviewed to those most intimately involved in the process, which included only those a part of ship's company, and we based our data off those small number of interviews. This decision took into consideration time constraints for both researchers and interviewees.

C.   RESEARCH QUESTIONS

In this research, we used answers to interview questions to help develop cost/price data for labor involved in the officer mess bill collection process. In doing so, we aim to answer the following questions:

1.   Is the policy governing the collection of mess bills for officers on ships efficient?

2.   How should the policy for the collection of mess bills for officers on ships be changed?

D.   OVERVIEW OF CHAPTERS

The organization of this thesis is as follows. Chapter II discusses background information relevant to the history of the officer's mess on board navy ships, how this history shaped current policy, and current policy. Chapter III illustrates the methodology used to facilitate and analyze this research to include a description of the data gathered and the models used. Chapter IV discusses the analysis of the data. Chapter V explains the results of that data and recommendations from our analysis. Chapter VI summarizes our research and posits areas for further research within this topic.

THIS PAGE INTENTIONALLY LEFT BLANK

II.   BACKGROUND INFORMATION

A.   SUBSISTENCE PAY HISTORY AND POLICY

Military members receive several different types of pay. The main type of pay is called Regular Military Compensation (RMC) which 37 United States Code (U.S.C.) 101(25) defines as "the total of the following elements that a member of the uniformed services accrues or received, directly or indirectly, in cash or in kind every payday: basic pay, basic allowance for housing, basic allowance for subsistence, and federal tax advantage accruing to the aforementioned allowances because they are not subject to federal income tax" (Kapp & Torreon, 2017, p. 2).

BAS is included in RMC. BAS provides "a cash allowance to members of the armed forces to defray a portion of the cost of subsistence, such allowance being payable to all enlisted and officer personnel, with variations to account for the unavailability of adequate messing facilities at some duty stations" (Curtis, 2005, p. 183). Historically, officers and enlisted receive different BAS rates, with the federal government deciding time and again to cover the full cost of only enlisted meals (Kapp & Torreon, 2017). For instance, in 2017 the rate for enlisted was $368.29 while the rate for officers was $253.63 (Federalpay.org, n.d.). The BAS rate is modified by the Secretary of Agriculture annually on 1 October based on the United States Department of Agriculture's (USDA) Food Cost Index for a male age 20–50 in the previous fiscal year (Kapp & Torreon, 2017). The Office of the Undersecretary of Defense Comptroller then publishes these rates (DoD, 2007).

The Career Compensation Act of 1949 wrote into law the requirement to provide officers with BAS. Furthermore, it stipulated the three circumstances when enlisted could receive BAS: "(1) When rations in kind are not available; (2) when permission to mess separately is granted; or (3) when assigned to duty under emergency conditions where no Government messing facilities are available" (Career Compensation Act of 1949). Enlisted personnel only received BAS for these exceptions; otherwise, they are entitled to Rations-In-Kind (RIK). In a messing operation, each enlisted member entitled to RIK and accounted for on board is converted to ration credits and gives the mess a monetary value

with which to procure and expend meals (Navy Department Naval Supply Systems Command [NAVSUP], 2016). Enlisted members never saw any of these costs, nor had anything deducted from their pay for food. They instead received meals at government dining facilities at no cost to them (RIK) (Kapp & Torreon, 2017, p. 8). Throughout the decades, the government made several minor modifications to enlisted BAS regulations, especially during the Gulf War, in relation to deployed service members' eligibility; however, the three exceptions above essentially remained the same (Hosek & Totten, 2002).

However, a 2002 Congressional amendment to 37 U.S.C. § 402 provided enlisted personnel with full BAS and required these personnel to pay for all their meals at government dining facilities. Those Navy enlisted assigned to shore and sea duty who had been receiving RIK now received full BAS, but would "be charged via automatic pay account deduction for all meals made available (whether eaten or not) at the discount meal rate" (Department of the Navy, 2002).

Officers, on the other hand, are not charged via automatic pay account deductions for their meals. Instead, every officer stationed on board a ship or attached to a ship must pay a monthly mess bill to the ships wardroom officer. When inport, officers are charged only for meals consumed, but underway, all three meals are charged regardless of whether eaten or not (NAVSUP, 2016). Mess bill collection utilizes a shipboard ATM system called Navy Cash that involves careful internal monitoring and requires each individual officer to pay their bill prior to the due date.

Only assumptions can be made about why the government fully subsidizes enlisted meals and not officer meals, as there is no definitive documentation stating the reasoning behind the two different BAS rates. The rank structure, pay scales, and housing regulations all may play a role. Traditions, especially in military customs and courtesies, guide current policies and regulations.

B. OFFICER'S WARDROOM AND MESS BILL HISTORY

The wardroom or wardrobe began in the 18th century as a storage room for confiscated items, that when empty, officers would use to socialize (Naval Education and Training Program Development Center, n.d.). When "pirating had ended, the wardrobe was used exclusively as an officers' mess and lounge" and its name changed to wardroom (Naval Education and Training Program Development Center, n.d.). Historically, the wardroom offered a place for officers to relax, eat, and converse with fellow officers. The Wardroom Guide from 1968 describes the wardroom as "each officer's seagoing home, a home in which he should be proud to entertain his relatives and friends" (Bureau of Naval Personnel, 1968, p. 19). This room enforced the separation of rank with stewards serving officers their meals on fine china while enlisted consumed their meals in the general mess on metal or plastic trays (Bureau of Naval Personnel, 1946).

The officer's mess offered a different menu than the general mess, created by the Chief Steward that required the approval of the Mess Treasurer and the Executive Officer (XO) (Bureau of Naval Personnel, 1946). Procurement of food from ashore commercial sources was encouraged and the caterer was required to supervise the Chief Steward to ensure he "has not taken the easy way and let the general mess menu…dictate most of the menu planning" (Bureau of Naval Personnel, 1968, p. 16). Further, greater emphasis was placed on taste and nutrition than finance: "The financial aspects of menu planning are far less important than nutritional considerations, though both, of course must be kept constantly in mind. Economy in mess administration is a virtue, but economy at the expense of comfort and savory meals is the antipathy of good mess management" (Bureau of Naval Personnel, 1968, p. 16). The priority in the officer's mess was not cost to the officers, but quality of the meals.

Proper menu planning ensured "maximum enjoyment from the investment made with assurance that the best possible use is being made of mess funds" (Bureau of Naval Personnel, 1968, p. 16). Every month each officer was required to pay the mess treasurer for his share of the food cost. The items required to fulfill the approved menu were purchased either from the general mess or ashore (Bureau of Naval Personnel, 1946). Based on the total cost of the monthly bill, each officer would "pay a mess bill to meet his share

of the cost" in advance (Bureau of Naval Personnel, 1946, p. 152). This share of the cost is the same for every officer, which often led to disapproval from other members of the mess when one officer would bring multiple guests repeatedly to dine in the wardroom (The Naval Officer's Manual, 1951). Equal share splitting amongst all officers in the wardroom, regardless of the number of meals consumed resulted in a flexibility in meal rates. Each breakfast, lunch, and dinner was a different rate every day dependent upon what items the mess caterer purchased. In contrast, the general mess received RIK for each sailor, which was a fixed dollar amount preventing flexibility.

The Naval Officer's Guide of 1960 explained the mess bill requirement:

The officers' mess is organized on a businesslike basis. There is a mess fund to which each officer must contribute his share on joining the mess. As an officer receives a ration allowance from the Navy, it is a courteous gesture, within the first 24 hours aboard, to ask the mess Treasurer for his mess bill and mess entrance fee and to pay them at once. The monthly mess assessments defray the cost of food, periodicals, other essentials, and conveniences...At the close of each month, the Mess Treasurer must give the mess a statement of the mess accounts, which is audited by the ship's Auditing Board. (Ageton & Mack, 1960, p. 100)

The mess bill was pre-paid. The Naval Officer's Guide states, "each officer must contribute his share (the per-person value of the mess on the last day of the preceding month) and pay his mess bill (the anticipated cost of the current month) upon joining the mess. Custom dictates that officers pay their mess bills within twenty-four hours of joining and promptly at the beginning of each succeeding month" (Mack & Paulsen, 1983, pp. 153–154). Officers paid equal shares split amongst them all in advance for the estimated cost of the next month. This cost would vary monthly depending on the specific menu the XO approved and the costs associated with procuring the items required to fulfill that menu; however, there was a low and high limit for these costs (Bureau of Naval Personnel, 1968). These limits ensured the mess bill did not "place a heavy burden on members of the mess" and were dictated by each individual wardroom as to what was reasonable (Bureau of Naval Personnel, 1968, p. 10).

In the 1900s, the officer's wardroom was a formal room, for officers only, that required and encouraged a separate menu from the general mess. This menu focused on

taste over cost. The cost of all food items purchased for the wardroom for the month resulted in a mess bill. All officers in the mess split the mess bill equally and paid in advance at the beginning of each month. Each wardroom established their own meal rate ranges. Time changes all things, and the wardroom and mess bill collection process is not exempt.

C.   NAVY STANDARD CORE MENU

In late 2005, the Navy implemented the Navy Standard Core Menu (NSCM) designed to streamline logistics, standardize and reduce inventory, and reduce afloat workload (Naval Department Naval Supply Systems Command [NAVSUP], 2007). Each ship class received a customized 21-day menu based on size of the crew and mission set (NAVSUP, 2007). The implementation of the NSCM required all private messes, including the wardroom, to align with general mess operations. Beginning in 2007, strong verbiage laid out that "all officer messes will subsist from the general mess", meaning the officer mess will no longer receive different food or a special menu (NAVSUP, 2007, p. 463). All messes on the ship will serve the same food for every meal according to the published menu per the NSCM. The most recent revision of this publication limits the wardroom even further explaining: "Under no circumstances shall the Wardroom/CPO [Chief Petty Officer] mess serve a different menu than the standard GM [General Mess] menu. If additional food such as taco bar ingredients and beverage items are desired by the wardroom/CPO messes and are not on the standard GM [General Mess] menu for that particular day those items shall be purchased separately in the form of a bulk sale" (NAVSUP, 2016, p. 248). BAS does not fund the sale of bulk food items to the wardroom. These sales are an additional out of pocket expense on top of the daily price of meals established by the USDA.

Early documentation indicates officers paid their mess bills in advance; however, that is no longer the case. Beginning in the 1990s, the wardroom mess could base the mess bill on "either on a flat per-person rate or on the number of meals actually consumed" (Mack, Seymour, & McComas, 1998, p. 95). With the advent of charging only for meals consumed, the bills were solicited at the end of the month and the wardrooms operated on

essentially a credit system. Currently, the wardroom officer tracks meals consumed on the NAVSUP form 1046 and inputs this data into the FSM system. The bill then goes out to the members of the mess at the end of the month for payment prior to the 15th of the following month. On the 15th of the month, the wardroom officer is required to pay the general mess for all the meals consumed by the wardroom (NAVSUP, 2016).

With the standardization of all Navy messes, the wardroom changed. This change requires consideration of a change in payment methods, collection processes, and the way we charge officers for meals. The benefit of receiving a higher quality, specialized meal no longer exists in the wardroom. In keeping with tradition, officers still pay out of pocket each month for their meals. Only now, that out of pocket expense purchases exactly the same food for which the government fully supplements the cost for enlisted personnel.

III. METHODOLOGY

This study explores the officer mess bill collection process on a Nimitz-class Aircraft Carrier (CVN). A CVN is an extreme example of the collection process with more than 150 officers stationed on the ship and over 400 officers on board during a deployment. With this large amount of officers on board, specific procedures outlined in the policy set forth by Commander, Naval Air Forces Instruction (CNAFINST) 4440.2D must be followed ensuring little variation in the way mess bills are collected on CVNs throughout the Navy.

The first step included conducting interviews with the people directly involved with the collection process. Specifically, interviews with the wardroom officer, wardroom division (S-5) records keeper, disbursing officer, and food service officer. The interview questions were specific to the tasks completed in the process and the average time it took to complete each task. The questions encompassed both inport and underway processes to distinguish any differences. The wardroom officer also provided us with copies of the ship's NAVSUP Form 1046 (Figure 1) and a count of the ranks of every officer on board the ship during its deployment (Table 1). The 1046s verified that the count for ship's company was accurate. The wardroom officer provided the remaining officer counts to include the Strike Group staff, Carrier Air Wing (CVW) staff, Destroyer Squadron (DESRON) staff, and nine aircraft squadrons. All of these parties are on board for a deployment so it was important to account for each of them in the process while underway.

Figure 1. NAVSUP Form 1046

Table 1.   Officer Count by Rank

Unit	RDML	CAPT	CDR	LCDR	LT	LTJG	ENS	CWO5	CWO4	CWO3	CWO2	Total
Strike Group (Flag) Staff	1	3	6	7	4	2	-	-	-	-	-	23
CVN (Ship's Company)	-	4	19	31	44	32	21	-	2	5	4	162
CVW Staff	-	2	1	4	13	1	-	-	-	-	1	22
DESRON Staff	-	2	1	3	7	6	-	-	-	-	-	19
HSC Squadron	-	-	2	7	14	9	-	-	-	1	-	33
HSM Squadron	-	-	2	5	13	8	1	-	-	2	-	31
VFA Squadron	-	-	2	6	25	2	1	-	-	-	2	38
VFA Squadron	-	-	2	5	8	2	2	-	-	1	1	21
VFA Squadron	-	-	2	4	12	1	-	-	-	1	2	22
VFA Squadron	-	-	2	6	8	4	1	-	-	-	1	22
VAW Squadron	-	-	2	5	15	10	1	-	-	-	-	33
VAQ Squadron	-	-	2	6	13	2	-	-	-	-	-	23
VRC Squadron	-	-	-	1	6	-	-	-	-	-	-	7
Total	1	11	43	90	182	79	27	-	2	10	11	456

CVN is ship's company. These personnel are on board the ship for inport and underway periods.

After mapping out the inport and underway processes determined from the interviews, we used our combined experience with the mess bill collection process on ships (twelve years) to assign a minimum and maximum time to complete each task. In order to create two (inport and underway) models simulating ranges of man-hours and labor costs tied to the process, we utilized a simulation program called Oracle Crystal Ball. This is a spreadsheet-based application that allowed us to simulate the officer mess bill collection process 50,000 times, providing us a realistic measure of actual process time.

Labor costs were derived from the FY 2018 DoD Military Personnel Composite Standard Pay and Reimbursement Rates (Figure 2) published by the Office of the Under Secretary of Defense. The annual DoD composite rate encompasses the average basic pay, basic allowance for housing, basic allowance for subsistence, special pays, and other costs the average Navy member incurs (Roth, 2017). While the composite rate is not the fully burdened cost of Navy personnel, budget and management studies within the DoD often use this rate (Roth, 2017).

MILITARY COMPOSITE STANDARD PAY AND REIMBURSEMENT RATES
DEPARTMENT OF THE NAVY
FOR FISCAL YEAR 2018 [1]

MILITARY PAY GRADE	AVERAGE BASIC PAY	ANNUAL DOD COMPOSITE RATE [2]	ANNUAL RATE BILLABLE TO OTHER FEDERAL AGENCIES [3] [4]
O-10	$189,665 [5]	$301,892	$308,216
O-9	188,834	306,930	313,254
O-8	176,092	288,690	295,014
O-7	153,234	263,581	269,905
O-6	131,235	239,477	245,801
O-5	105,641	206,227	212,551
O-4	89,067	183,006	189,330
O-3	71,665	157,038	163,362
O-2	55,792	126,149	132,473
O-1	40,622	100,733	107,057
WO-5	$106,582	$195,959	$202,283
WO-4	91,658	175,792	182,116
WO-3	77,748	156,519	162,843
WO-2	64,660	139,097	145,421
WO-1	$0	$0	$0
E-9	$78,741	$151,359	$157,683
E-8	62,123	128,491	134,815
E-7	53,481	116,512	122,836
E-6	43,351	102,378	108,702
E-5	34,384	86,108	92,432
E-4	27,940	69,312	75,636
E-3	23,876	57,568	63,892
E-2	21,912	51,166	57,490
E-1	18,635	45,228	51,552
CADETS	$12,949	$19,246	Not applicable

Notes:

[1] Reimbursement procedures for Foreign Military Sales (FMS) are specifically addressed in the DoD FMR Vol. 15 Section 070203. Reimbursement of the acceleration factor shall be deposited into the Defense Health Program (97*0130). Reimbursement of the per capita normal cost for Medicare-eligible retiree health care (MERHC) accrual shall be deposited into the Miscellaneous Receipts Account 3041.

[2] The annual DoD composite rate includes the following military personnel appropriation costs: average basic pay plus retired pay accrual, Medicare-eligible retiree health care (MERHC) accrual, basic allowance for housing, basic allowance for subsistence, incentive and special pay, permanent change of station expenses, and miscellaneous pay. **Includes** a per capita normal cost of $4,693 for MERHC accrual -- **see Tab K-1**.

[3] The annual rate billable to Other Federal Agencies recovers additional military related health care costs financed by the Defense Health Program. The annual billable rate includes an acceleration factor of $11,017 for all personnel. Reimbursement of the acceleration factor shall be deposited into the Defense Health Program (97*0130). **Excludes** a per capita normal cost of $4,693 for MERHC accrual -- **see Tab K-1**.

[4] To compute a Daily Rate, apply a factor of .00439. To compute an Hourly Rate, apply a factor of .00055.

[5] Basic pay for these officers is limited to the rate of basic pay for Level II of the Executive Schedule, which is currently projected to be $189,665 for fiscal year (FY) 2018.

Tab K-3

Figure 2. Military Standard Composite Pay and Reimbursement Rates FY2018.
Source: Roth (2017).

A.   INTERVIEWS

It is important to note that our twelve years of combined experience with the officer mess bill collection process shaped the interview questions. Furthermore, we kept all interviews completely anonymous to prevent any self-editing of responses or any unintended consequences from their responses to our process related questions. Within this section, we will discuss why we selected a CVN, why we selected the interviewees, and why we selected the questions to gather data.

The CVN is the largest and most complex sea-going operation. The same goes for the mess bill collection process on board CVNs. We worked with representatives from the TYCOM, the entity that oversees the administration of all entities in its' geographic and domain jurisdiction, to ensure our research would not infringe on operations. We then engaged our selected CVN, informing them of our research topic, plan, and how they could assist.

We selected four specific individual positions to interview. As mentioned previously, our team has a combined twelve years of managing mess bills. Specifically, our experience includes five years served as the wardroom officer on board two separate CVNs. This experience allowed us to understand the intricacies involved in the collection process and; therefore, helped to determine the positions we needed to interview. The four personnel we interviewed include the wardroom officer, S-5 records keeper, disbursing officer, and the food service officer (FSO). These four individuals play the most important roles within the process and serve as subject matter experts for their role within the process.

Next, we designed a standard set of questions about the process for all interviewees. By focusing the questions on the process, our research team eliminated any personal opinion of the subject; thereby, receiving objective responses. Our questions needed to help us answer our research questions. In order to answer those questions, we first needed the process laid out step-by-step by each individual followed by average times spent performing each step in the process. We could use that data to estimate man-hours and labor costs involved in administering the current policy for mess bill collection. We

submitted the below list of questions by email for each interviewee to review prior to the phone interview in order to enable smooth, yet detailed interviews.

1. Please describe the process of collecting mess bills inport from start to finish used on this ship. How does it change when underway? What resources are required at each step of the process?

2. How much time, in hours, on average does each step of the process take inport? How much time underway?

3. Walk me through the process of paying a mess bill from start to finish in detail. How much time did this process take this month? How much time does it take on average?

4. Are 100% of the mess bills collected by the required due date every month? How is FSO paid in full if not all the bills have been collected? What is the total value of the mess bill you collected this month?

5. How many people, on average, forget or fail to pay monthly?

6. Describe the process for collecting delinquent bills on this ship. What if the person in question has detached the ship? How much time, in hours, did the collection or attempt to collect delinquent bills take this month? How much time, in hours, on average is spent on uncollected bills?

7. On average, how many hours of the workday are allocated to the mess bill collection/tracking/administering/management/reporting?

8. Is there a documented manning shortage currently in Food Service, and/or Hotel Service personnel?

The choice to conduct phone interviews versus other data gathering methods was appropriate for the scope of our project. In focusing on one CVN, we only required information from a small number of individuals. Phone interviews allowed us to gather the data we needed to help answer our research questions. Additionally, the interview method

allowed us the ability to clear up any misinterpretations of our questions, which helped ensure accurate data.

The information we collected from all four interviewees provided all the information required to layout the officer mess bill collection process, broken down step-by-step, and with an average time required to complete each step. Where we believe doing so communicates more clearly, we converted time required from hours to minutes. The data collected allowed us to calculate man-hours and labor costs to determine if the current policy in place to collect officer mess bills is cost and procedurally efficient.

B.   PROCESS LAYOUT

Once the interviews were completed, we extrapolated the data from the responses to create process tables. The mess bill collection process takes place over a two-month period. In the first month, all meals (breakfast, lunch, and dinner) are tracked for each officer. The second month is where each officer pays the wardroom officer who then completes monthly closeout. For example, officers pay for all January meals eaten in February. Once the wardroom officer collects all payments, the closeout for January's mess bill will also be completed in February. Simultaneously, meals eaten by officers in February are tracked and documented, so while some of the tasks apply to the previous month and others to the current month, every month contains all tasks pertaining to the mess bill collection process. Tables 2 and 3 show the tasks completed for an inport and underway period respectively. Each table lists the positions involved in the task, a brief explanation of the task, the average time to complete the task, the minimum time to complete the task, and the number of occurrences of a task in one month. As mentioned before, the minimum and maximum time values were determined from our combined experience with the process to provide variability for any given task each month.

For the purpose of this study, we assumed the CVN is inport for the entirety of the month or underway with all Strike Group personnel embarked for the entirety of the month. In the real world, there can be overlap of the inport and underway processes during any given month. In other words, a CVN can get underway at any point of the month so the ship follows the inport process until the ship is underway and vice versa. Another

possibility is the CVN could also be underway with only a portion of the Strike Group embarked; however, a CVN will only deploy with the entire Strike Group embarked. Our goal was to calculate the man-hours and labor costs associated with the officer mess bill collection process on a CVN for inport and underway periods. Looking at the two events as independent scenarios on a monthly basis shows an accurate picture of each process.

1. Inport Process

We derived the tasks for the processes directly from the interview responses. The majority of the tasks are the same for both processes, although there are nuances for each process. The tasks are in sequential order by task number; however, some tasks occur simultaneously. For example, officers can load their Navy Cash Card (Task 8) at any point in the month before they pay their mess bill.

Looking at the inport process in Table 2, tasks 1 and 2 are the only tasks that are not a part of the underway process: the distribution and the collection of a paper copy of the NAVSUP 1046 (shown in Figure 1, in the previous chapter). Inport, meals are tracked using the honor system so an officer who eats a meal will initial by their name for each meal consumed every day. The S-5 records keeper collects the 1046s the following day and inputs the information from the 1046s into the FSM system Monday through Friday. The records keeper will leave two blank 1046s out for the weekend and collect them the following Monday. There are 22 occurrences for tasks 1 and 2 because these are only completed on workdays in the month.

Table 2.   Inport Officer Mess Bill Collection Process

Task #	Position	Task	Avg Time (mins)	Minimum (mins)	Maximum (mins)	Occurrences (month)
		Inport Officer Mess Bill Collection Process				
1	S-5 Records Keeper	Print out and distribute 1046	5	4	10	22
2	S-5 Records Keeper	Collect and input 1046 information into FSM	15	10	30	22
3	S-5 Records Keeper	End of month FSM verification	60	45	120	1
4	Wardroom Officer	End of month verification of 1046 from FSM	60	45	90	1
5	S-5 Records Keeper/S-2 Records Keeper	Reconcile FSM collection with S-2 Records Keeper	15	10	60	1
6	Wardroom Officer	Email balance amounts to all officers	15	10	20	1
7	Wardroom Officer	Fix balance disputes	30	15	120	1
8	Officers	Load Navy Cash Cards to make payment	5	2	10	162
9	S-5 Records Keeper/Officers	Mess bill collection per officer	3	2	5	162
10	Wardroom Officer	Verify balances are being paid during collection period	30	15	60	6
11	S-5 Records Keeper	Send verification emails to DISBO for unpaid balances	15	10	20	4
12	Wardroom Officer	Send out second notice email to all officers for unpaid balances	15	10	20	1
13	Wardroom Officer	Send out third notice email to all officers for unpaid balances	15	10	20	1
14	Wardroom Officer	Contact individual officers who have not paid by the due date	5	2	15	5
15	Wardroom Officer	Email XO/SUPPO to let them know all balances have been paid	5	2	10	1
16	Wardroom Officer/S-2 Cash Collection Agent	Transfer payment from Wardroom account to General Mess	15	5	30	1
17	Disbursing Officer	Verify wardroom payments have cleared for end of month	60	45	180	1
18	Wardroom Officer	Fill out 1367	120	90	240	1
19	Disbursing Officer/Wardroom Officer	Review and sign the 1367	5	3	10	1
20	Hotel Services Officer/Wardroom Officer	Review and sign the 1367	5	3	10	1
21	Supply Officer/Wardroom Officer	Review and sign the 1367	5	3	15	1
22	Executive Officer/Wardroom Officer	Review and sign the 1367	5	3	15	1
23	Wardroom Officer	Email completed 1367 to CNAF N4122 personnel	5	4	15	1

Other tasks with multiple occurrences for the inport process are tasks 8, 9, 10, 11, and 14. Tasks 8 and 9 involve the officers taking action. There are 162 officers on board the ship and each officer completes these activities. The wardroom officer completes task 10 during the eight-day collection period (5th-12th of each month). There are only six occurrences of this task to account for a weekend falling within the collection period. The S-5 records keeper completes task 11 four times throughout the collection period. The wardroom officer completes task 14 at the end of a collection period. At this time, the wardroom officer tracks down any officers who have not paid. While task 14 varies slightly from month-to-month, this task is kept constant at five occurrences a month.

2.   Underway Process

As previously mentioned, the majority of tasks for the underway process are the same as the tasks for the inport process. Looking at the underway process in Table 3, tasks 1, 8, 10, 11, and 12 differ from the inport process. Underway, every officer on board is automatically charged for every meal served regardless of whether or not they eat, thus eliminating the necessity to print a paper copy of the 1046. However, FSM requires a completed 1046 (Task 1) and inputting the data takes much longer than inport due to the large increase in the number of officers on board while underway. Data for the 1046 is inputted daily underway resulting in 30 occurrences of this task. Similarly, task 12 for the

underway process is the same as task 10 for the inport process with one exception; it is now completed every day during the collection period (8 occurrences) since the ship is underway.

Table 3.   Underway Officer Mess Bill Collection Process

Task #	Position	Task	Avg Time (mins)	Minimum (mins)	Maximum (mins)	Occurrences (month)
	Underway Officer Mess Bill Collection Process					
1	S-5 Records Keeper	Input 1046 information into FSM	60	45	75	30
2	S-5 Records Keeper	End of month FSM verification	60	45	120	1
3	S-5 Records Keeper	Compare FSM information with departures/arrivals	60	30	75	1
4	Wardroom Officer	End of month verification of 1046 from FSM	60	45	90	1
5	S-5 Records Keeper/S-2 Records Keeper	Reconcile FSM collection with S-2 Records Keeper	15	10	60	1
6	Wardroom Officer	Email balance amounts to all officers	15	10	20	1
7	Wardroom Officer	Fix balance disputes	30	15	120	1
8	Officers	Load Navy Cash Cards to make payment	5	2	10	456
9	S-5 Records Keeper/Officers	Mess bill collection per officer	3	2	5	162
10	Squadron/CVW/DESRON/Flag Representatives and Officers	Mess bill collection per officer	3	2	5	294
11	Wardroom Officer/Squadron/CVW/DESRON/Flag Representatives	Transfer payment from representatives to Wardroom	5	4	10	12
12	Wardroom Officer	Verify balances are being paid during collection period	30	15	60	8
13	S-5 Records Keeper	Send verification emails to DISBO for unpaid balances	15	10	20	4
14	Wardroom Officer	Send out second notice email to all officers for unpaid balances	15	10	20	1
15	Wardroom Officer	Send out third notice email to all officers for unpaid balances	15	10	20	1
16	Wardroom Officer	Contact individual officers who have not paid by the due date	5	2	15	5
17	Wardroom Officer	Email XO/SUPPO to let them know all balances have been paid	5	2	10	1
18	Wardroom Officer/S-2 Cash Collection Agent	Transfer payment from Wardroom account to General Mess	30	10	60	1
19	Disbursing Officer	Verify wardroom payments have cleared for end of month	60	45	180	1
20	Wardroom Officer	Fill out 1367	120	90	240	1
21	Disbursing Officer/Wardroom Officer	Review and sign the 1367	5	3	10	1
22	Hotel Services Officer/Wardroom Officer	Review and sign the 1367	5	3	10	1
23	Supply Officer/Wardroom Officer	Review and sign the 1367	5	3	15	1
24	Executive Officer/Wardroom Officer	Review and sign the 1367	5	3	15	1
25	Wardroom Officer	Email completed 1367 to CNAF N4122 personnel	5	4	15	1

Tasks 8, 10, and 11 consider the embarked Strike Group. Task 8 is the same task as in the inport process, except for the increase in officers from 162 to 456 when underway. Tasks 10 and 11 are tasks specific to the embarked Strike Group. For each unit (Flag Staff, CVW Staff, DESRON Staff, and nine squadrons), a representative collects the mess bills from each of their officers (Task 10) and make payment to the wardroom officer for the entire unit (Task 11). Task 10 has 294 occurrences because that is the amount of Officers within the 12 units. Task 11 has 12 occurrences because that is how many units are on board, not including ship's company, when the CVN is underway with the Strike Group embarked.

C.   CRYSTAL BALL MODELS

After we conducted the interviews and mapped out the processes, we utilized Oracle Crystal Ball to build models to simulate the time and costs incurred during each task in both processes. The model calculated the total times and costs for each position that has a part in the mess bill collection process. The goal of the models was twofold: to estimate the time and costs spent on the current mess bill collection process and to find the positions and tasks driving the cost of the process.

Utilizing the annual DoD composite rates for the Navy in 2018 (shown in Figure 2, in the previous chapter), we assigned labor costs to the process. These costs were converted to hourly costs by dividing the annual composite rate by 52 weeks and then dividing by the average number of hours worked per week. For this study, we assumed a 40-hour workweek regardless of whether inport or underway. Table 4 displays the hourly rate for each rank.

Table 4.   Hourly Rate by Rank. Adapted from Roth (2017).

Rank	Annual DOD Composite Rate	Hourly Rate
RDML	$ 263,581	$ 126.72
CAPT	$ 239,477	$ 115.13
CDR	$ 206,227	$ 99.15
LCDR	$ 183,006	$ 87.98
LT	$ 157,038	$ 75.50
LTJG	$ 126,149	$ 60.65
ENS	$ 100,733	$ 48.43
CWO4	$ 175,792	$ 84.52
CWO3	$ 156,519	$ 75.25
CWO2	$ 139,097	$ 66.87
PO5	$ 86,108	$ 41.40

1.   Building the Inport Officer Mess Bill Collection Model

We utilized Crystal Ball to build the model because of its ability to assign a random variable of time for each task based on a range determined by the data recorded in the collection process (shown in Table 2, in the previous chapter). The software allowed us to

run 50,000 iterations of the process. By increasing the sample size, the reliability of our data increased. Utilizing the time recorded from each iteration, we determined labor hour costs by using the inport hourly rates in Table 4. The following sections describe this process in detail.

a.   Step One: Insert Inport Mess Bill Collection Data

First, we created a new excel spreadsheet with Crystal Ball. The inport process data from Table 2 and hourly rate data from Table 4 were inputted in the spreadsheet as reference cells for the random variables and calculations. Table 5 shows the data from the inport model.

Table 5.   Inport Data

Inport Data					
Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	5	4	10	22
S-5 RK	2	15	10	30	22
S-5 RK	3	60	45	120	1
WARDO	4	60	45	90	1
S-5 RK/S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	162
S-5 RK/Officers	9	3	2	5	162
WARDO	10	30	15	60	6
S-5 RK	11	15	10	20	4
WARDO	12	15	10	20	1
WARDO	13	15	10	20	1
WARDO	14	5	2	15	5
WARDO	15	5	2	10	1
WARDO/S-2 CCA	16	15	5	30	1
DISBO	17	60	45	180	1
WARDO	18	120	90	240	1
DISBO/WARDO	19	5	3	10	1
HSO/WARDO	20	5	3	10	1
SUPPO/WARDO	21	5	3	15	1
XO/WARDO	22	5	3	15	1
WARDO	23	5	4	15	1

Rank	Hourly Rate
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.65
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

b. *Step Two: Assign Random Variables Utilizing Triangular Distribution*

Second, we defined an assumption for each task occurrence. We used triangular distribution to define each random variable because it only requires three inputs: average, minimum, and maximum. Once we assigned the distribution to these inputs, the program provided a random variable within the assigned range of the triangle with the peak being the average. Then the program assigned a random variable to each occurrence of a task within a month's time to capture variability in the process. If enough time was permitted, a stopwatch time study could be performed over a year to capture observed data making other distributions an option. Triangular distribution matched the data available for this study.

For example, task 1 has 22 occurrences each month for the inport process. Referencing the data in Table 5, each occurrence of task 1 can take anywhere from four to ten minutes with an average of five minutes. In other words, the task cannot be completed in less than four minutes and it will never take longer than ten minutes. Table 6 displays the random variables provided for one iteration of the model simulation. The numbers highlighted in green are the times this iteration simulated for each of the 22 occurrences. As said before, the range of numbers are all within the four to ten-minute timeframe.

Table 6. Random Variables for Task 1

Random Variables	
Task	Time
1	5.83
1	5.10
1	6.08
1	8.87
1	4.51
1	4.29
1	6.35
1	5.93
1	6.40
1	6.51
1	7.48
1	5.92
1	5.19
1	4.76
1	8.31
1	7.25
1	4.25
1	7.50
1	4.54
1	5.51
1	7.71
1	6.81

One iteration is the equivalent to one simulated month of the inport process. Again, this is only task 1. All other tasks were also assigned a random variable of time for each occurrence of the task within a month's time based on the average, minimum, and maximum times in Table 5.

c.   Step Three: Perform Task Calculations for Inport Model

(1)   Task Time

Task time is the summation of the random variables, based on the amount of occurrences, for each task simulated in a single iteration. It is the total time a specific task took to complete over the course of a single month.

Using the data from Table 6, the sum of the 22 variables (based on 22 occurrences) is 135.09 minutes. This total is task 1's task time for one iteration of the simulation and matches the calculation result shown in Table 7.

The task time for every other task is completed the same way. Table 7 shows the task times calculated for all tasks for this single iteration of the simulation. The total task time is the sum of all the tasks for this iteration. This simulated month shows the inport mess bill collection process took a total of 2,812.66 minutes, or approximately 47 hours.

(2)   Task Cost

Task cost is the total labor hour cost for performing each task. To calculate this cost, the task times were first divided by 60 to normalize the time to hours. This amount was multiplied by the hourly rate (refer to Table 4) of each position involved in the task.

Using task 1 as an example to calculate the task cost, 135.09 was divided by 60 to normalize the time to 2.25 hours. This amount was then multiplied by $41.40 (the hourly rate of the S-5 records keeper) equaling approximately $93 which is the cost to complete task 1 for this simulated month.

For a task involving multiple positions, the task time was multiplied by each of the positions' hourly pay. Task 16 includes the wardroom officer and the S-2 cash collection agent. Utilizing the data from the same iteration, the first step is to divide 8.35 by 60 to get 0.14 hours. This amount is multiplied by $75.50 and $41.40 individually and then summed equaling approximately $16. This example illustrates the difference between task time and labor hours. Although the task time is 0.14 hours, the labor hours consumed to perform the task is 0.28 hours.

Table 7.   Inport Task Calculations

Inport Task Calculations		
Task #	Task Time (mins)	Task Cost
1	135.09	$ 93.21
2	362.52	$ 250.13
3	96.70	$ 66.72
4	82.37	$ 103.65
5	23.31	$ 32.17
6	15.15	$ 19.06
7	29.07	$ 36.58
8	924.22	$ 1,164.90
9	536.79	$ 1,044.16
10	229.77	$ 289.12
11	54.84	$ 37.84
12	14.16	$ 17.82
13	12.43	$ 15.64
14	44.69	$ 56.24
15	5.63	$ 7.09
16	8.35	$ 16.26
17	66.20	$ 66.91
18	141.82	$ 178.46
19	7.60	$ 17.24
20	5.03	$ 12.65
21	4.80	$ 13.96
22	6.46	$ 20.53
23	5.67	$ 7.14
Total	2812.66	$ 3,567.47

The cost calculations for tasks 8 and 9, those involving officers, are more complex due to the inclusion of various ranks. There are 162 officers for ship's company, which translates to 162 occurrences for tasks 8 and 9. For these costs, the officer count by rank (Table 1) was used to assign each rank the appropriate amount of occurrences. For example, there are 44 LTs on board so 44 out of the 162 simulated times were added together and multiplied by $75.50 to obtain the cost of LTs to task 8. This same procedure was completed for each of the officer ranks and then all of the costs were added together.

The calculation for task 9 was accomplished in a similar manner, except this task also includes the S-5 records keeper. Task 9 involves every officer from ship's company paying their mess bill to the S-5 records keeper. The S-5 records keeper costs had to be added to the cost of the officers to obtain the total task cost.

d. Step Four: Perform Positional Calculations for Inport Model

(1) Monthly/Yearly Time

The reference data in Table 5 and the calculated task times in Table 7 help derive the monthly time. The reference data displays every task with which each position is involved. Adding up all of the individual task times for each position calculates the monthly time.

For example, the S-5 records keeper is involved with tasks 1-3, 5, 9, and 11. Looking at Table 7, the times for these tasks are 135.09, 362.52, 96.70, 23.31, 536.79, and 54.84 respectively. The summation of these tasks comes out to a monthly time of approximately 1,209 minutes, or 20 hours for this iteration of the simulation, which is the amount of time, simulated by the model, the S-5 records keeper spent on the mess bill collection process in this iteration.

All other positions are calculated using the same method and are displayed for this iteration in Table 8. The total monthly time of 56.75 hours represents the labor hours spent on the process in this iteration. The yearly time of 681 hours is simply the monthly time multiplied by 12.

Table 8.   Inport Positional Calculations

Inport Postional Calculations					
Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Yearly Time (hrs)	Yearly Cost
Wardroom Officer	612.99	10.22	$ 771.34	122.60	$ 9,256.06
S-5 Records Keeper	1209.26	20.15	$ 834.35	241.85	$ 10,012.19
S-2 Records Keeper	23.31	0.39	$ 16.09	4.66	$ 193.03
S-2 Cash Collection Agent	8.35	0.14	$ 5.76	1.67	$ 69.10
Disbursing Officer	73.80	1.23	$ 74.59	14.76	$ 895.13
Hotel Services Officer	5.03	0.08	$ 6.33	1.01	$ 75.91
Supply Officer	4.80	0.08	$ 7.93	0.96	$ 95.11
Executive Officer	6.46	0.11	$ 12.40	1.29	$ 148.76
Officers	1461.00	24.35	$ 1,838.70	292.20	$ 22,064.36
Totals	3404.99	56.75	$ 3,567.47	681.00	$ 42,809.66

(2)   Monthly/Yearly Cost

Multiplying the monthly time in hours of each position by the appropriate hourly rate (shown in Table 4, in the previous chapter) calculates the monthly cost. For example, the cost of the wardroom officer for this iteration is 10.22 hours multiplied by $75.50 for an approximate monthly cost of $771. The yearly cost was the monthly cost multiplied by 12. This method of calculation holds true for each of the positions' costs, with the exception of the officers.

The cost for the officers are calculated in a similar manner as tasks 8 and 9 costs in the task cost section, with the exception of the S-5 records keeper. To explain, the costs associated with tasks 8 and 9 (Table 7) are $1,165 and $1,044 respectively. They combine for a cost of $2,209. The S-5 records keeper time associated with task 9 is 536.79 minutes, or 8.95 hours. These hours multiplied by $41.40 come out to approximately $370. Reduce this amount from the task 9 cost of $1,044 to eliminate the S-5 records keeper time and it becomes $674. This amount combined with the cost of task 8 ($1,165) equals an approximate officers cost of $1,839 which matches the calculation result for officers monthly cost in Table 8.

e.   Crystal Ball Layout of the Inport Officer Mess Bill Collection Model

Figure 3 is a screenshot of the inport officer mess bill collection model. It includes all of the tables covered in each of the previous sections. As mentioned above, there is a random variable cell for every occurrence of each task in the process so this screenshot does not capture the entire model. There are 399 random variables (total amount of occurrences) assigned for every iteration ran of this model.

Inport Officer Mess Bill Collection Model

Inport Data

Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	5	4	10	22
S-5 RK	2	15	10	30	22
S-5 RK	3	60	45	120	1
WARDO	4	60	45	90	1
S-5 RK/S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	162
S-5 RK/Officers	9	3	2	5	162
WARDO	10	30	15	60	6
S-5 RK	11	15	10	20	4
WARDO	12	15	10	20	1
WARDO	13	15	10	20	1
WARDO	14	5	2	15	5
WARDO	15	5	2	10	1
WARDO/S-2 CCA	16	15	5	30	1
DISBO	17	60	45	180	1
WARDO	18	120	90	240	1
DISBO/WARDO	19	5	3	10	1
HSO/WARDO	20	5	3	10	1
SUPPO/WARDO	21	5	3	15	1
XO/WARDO	22	5	3	15	1
WARDO	23	5	4	15	1

Rank	Hourly Rate
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.65
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

Random Variables

Task	Time
1	5.83
1	5.10
1	6.08
1	8.87
1	4.51
1	4.29
1	6.35
1	5.93
1	6.40
1	6.51
1	7.48
1	5.92
1	5.19
1	4.76
1	8.31
1	7.25
1	4.25
1	7.50
1	4.54
1	5.51
1	7.71
1	6.81
2	17.95
2	27.67
2	10.45
2	14.16
2	15.40
2	11.88
2	16.56
2	10.27
2	18.50
2	14.30
2	14.92
2	14.78
2	13.89
2	12.73

Inport Task Calculations

Task #	Task Time (mins)	Task Cost
1	135.09	$ 93.21
2	362.52	$ 250.13
3	96.70	$ 66.72
4	82.37	$ 103.65
5	23.31	$ 32.17
6	15.15	$ 19.06
7	29.07	$ 36.58
8	924.22	$ 1,164.90
9	536.79	$ 1,044.16
10	229.77	$ 289.12
11	54.84	$ 37.84
12	14.16	$ 17.82
13	12.43	$ 15.64
14	44.69	$ 56.24
15	5.63	$ 7.09
16	8.35	$ 16.26
17	66.20	$ 66.91
18	141.82	$ 178.46
19	7.60	$ 17.24
20	5.03	$ 12.65
21	4.80	$ 13.96
22	6.46	$ 20.53
23	5.67	$ 7.14
Total	2812.66	$ 3,567.47

Inport Postional Calculations

Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Yearly Time (hrs)	Yearly Cost
Wardroom Officer	612.99	10.22	$ 771.34	122.60	$ 9,256.06
S-5 Records Keeper	1209.26	20.15	$ 834.35	241.85	$ 10,012.19
S-2 Records Keeper	23.31	0.39	$ 16.09	4.66	$ 193.03
S-2 Cash Collection Agent	8.35	0.14	$ 5.76	1.67	$ 69.10
Disbursing Officer	73.80	1.23	$ 74.59	14.76	$ 895.13
Hotel Services Officer	5.03	0.08	$ 6.33	1.01	$ 75.91
Supply Officer	4.80	0.08	$ 7.93	0.96	$ 95.11
Executive Officer	6.46	0.11	$ 12.40	1.29	$ 148.76
Officers	1461.00	24.35	$ 1,838.70	292.20	$ 22,064.36
Totals	3404.99	56.75	$ 3,567.47	681.00	$ 42,809.66

Figure 3.   Crystal Ball Layout of Inport Officer Mess Bill Collection Model

f.　　　*Assumptions Utilized for the Inport Mess Bill Collection Model*

- Working hours inport are 40 hours a week.

- There are 22 working days a month inport.

- CVN is inport for the entirety of month for monthly calculations.

- CVN is inport for the entirety of a year for yearly calculations.

- Task 14 will have five occurrences a month.

- No personnel changes or promotions for the positions involved with the process throughout the year.

- Every officer will load their Navy Cash Card once a month to pay their mess bill.

- All tasks only account for actual time doing the task. There is no waiting time.

- Task 8 accounts for transit time to load Navy Cash Cards.

2.　　　**Building the Underway Officer Mess Bill Collection Model**

The underway officer mess bill collection model was built identically to the inport model described in detail in the previous section. The only changes are with the data itself. The method, layout, and computations were all completed the same way as described in the inport model. This section will briefly go through each step of the process again to cover the underway process.

a.　　　*Step One: Insert Underway Mess Bill Collection Data*

First, we created a new excel spreadsheet with Crystal Ball. The underway process data from Table 3 and hourly rate data from Table 4 were inputted in the spreadsheet as

reference cells for the random variables and calculations. Table 9 shows the reference data from the underway model.

There are 25 tasks in the underway model compared to 23 in the inport model. The only additional position is the unit representatives (12 occurrences for the 12 units in task 11). The representatives are also involved with task 10. There are 294 additional officers on board underway bringing the total officer count to 456.

Table 9.   Underway Data

Underway Data					
Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	60	45	75	30
S-5 RK	2	60	45	120	1
S-5 RK	3	60	45	90	1
WARDO	4	60	30	75	1
S-5 RK/S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	456
S-5 RK/Ship's Co	9	3	2	5	162
REPS/Officers	10	3	2	5	294
WARDO/REPS	11	5	4	10	12
WARDO	12	30	15	60	8
S-5 RK	13	15	10	20	4
WARDO	14	15	10	20	1
WARDO	15	15	10	20	1
WARDO	16	5	2	15	5
WARDO	17	5	2	10	1
WARDO/S-2 CCA	18	30	10	60	1
DISBO	19	60	45	180	1
WARDO	20	120	90	240	1
DISBO/WARDO	21	5	3	10	1
HSO/WARDO	22	5	3	10	1
SUPPO/WARDO	23	5	3	15	1
XO/WARDO	24	5	3	15	1
WARDO	25	5	4	15	1

Rank	Hourly Rate
RDML	$ 126.72
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.65
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

b.   ***Step Two: Assign Random Variables Utilizing Triangular Distribution***

Second, we assigned a random variable to each occurrence of a task within a month's time to capture variability in the process. Again, we used triangular distributions to assign each random variable a time derived between the minimum and maximum times in the reference data.

For example, task 1 in the underway model has 30 occurrences. Referencing the data in Table 9, each occurrence of task 1 can take anywhere from 45 to 75 minutes with an average of 60 minutes. Table 10 displays the random variables provided for one iteration of the model simulation. The numbers highlighted in green are the times this iteration of the model simulated for each of the 30 occurrences.

Table 10.   Random Variables for Task 1

Random Variables	
Task	**Time**
1	54.75
1	69.33
1	56.20
1	61.72
1	57.82
1	63.19
1	64.27
1	61.54
1	59.23
1	60.55
1	63.72
1	53.73
1	53.59
1	61.52
1	62.92
1	63.99
1	60.53
1	53.39
1	66.16
1	63.81
1	56.25
1	57.48
1	46.75
1	53.62
1	63.05
1	58.82
1	57.70
1	66.00
1	51.23
1	54.30

c. Step Three: Perform Task Calculations for Underway Model

(1) Task Time

Task time is the summation of the random variables, based on the amount of occurrences, for each task simulated in a single iteration. Using the data from Table 10, the sum of the 30 variables (based on 30 occurrences) is 1,777.20 minutes. This value is the task time for task 1 for one iteration of the simulation and matches the calculation result shown in Table 11.

Table 11 shows the task times calculated for all tasks for this single iteration of the simulation. This simulated month displays that the underway mess bill collection process took a total of 7,013.64 minutes, or approximately 117 hours.

Table 11.   Underway Task Calculations

Underway Task Calculations		
Task #	Task Time (mins)	Task Cost
1	1,777.20	$ 1,226.21
2	94.69	$ 65.33
3	50.57	$ 34.89
4	59.14	$ 74.42
5	49.58	$ 68.41
6	15.24	$ 19.18
7	84.82	$ 106.73
8	2,624.00	$ 3,397.32
9	538.75	$ 1,045.71
10	979.00	$ 2,479.40
11	74.96	$ 188.65
12	263.13	$ 331.10
13	66.31	$ 45.75
14	12.85	$ 16.17
15	15.70	$ 19.76
16	32.54	$ 40.94
17	4.50	$ 5.66
18	25.87	$ 50.40
19	78.94	$ 79.79
20	131.04	$ 164.88
21	4.91	$ 11.13
22	6.09	$ 15.31
23	6.04	$ 17.59
24	8.90	$ 28.29
25	8.87	$ 11.17
Total	7,013.64	$ 9,544.21

(2)   Task Cost

Task cost is the total labor hour cost for performing each task. To calculate the cost, the task times are divided by 60 to normalize the time to hours. This amount was multiplied by the hourly rate (Table 4) of each position involved in the task.

Using task 1 as an example to calculate the task cost, 777.20 was divided by 60 to normalize the time to 117 hours. This amount was then multiplied by $41.40 (the hourly rate of the S-5 records keeper) equaling approximately $1,226 which is the cost to complete task 1 for this simulated month. For a task involving multiple positions and/or ranks, the task cost was computed the same way as the example provided in the inport model task cost section.

d.   Step Four: Perform Positional Calculations for Underway Model

(1)   Monthly/Deployment Time

The reference data in Table 9 and the calculated task times in Table 11 help to derive the monthly time. The reference data displays every task with which each position is involved. Adding all the individual task times for each position calculates the monthly time.

For example, the S-5 records keeper is involved with tasks 1-3, 5, 9, and 13. Looking at Table 11, the times for these tasks are 1,777.20, 94.69, 50.57, 49.58, 538.75, and 66.31 respectively. The summation of these tasks comes out to a monthly time of approximately 2,577 minutes, or 43 hours for this iteration of the simulation.

All other positions are calculated using the same method and are displayed in Table 12 for this iteration. The total monthly time of 145.13 hours represents the labor hours spent on the process in this iteration.

As opposed to a yearly time utilized in the inport model, the underway model utilizes deployment time. Deployments are typically seven months; thus, the deployment time is the monthly time multiplied by seven. For example, the total deployment time is approximately 1,016 hours (145.13 hours multiplied by 7 months) for this iteration.

Table 12.   Underway Positional Calculations

Underway Positional Calculations					
Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Deployment Time (hrs)	Deployment Cost
Wardroom Officer	754.60	12.58	$ 949.52	88.04	$ 6,646.66
S-5 Records Keeper	2,577.10	42.95	$ 1,778.12	300.66	$ 12,446.83
S-2 Records Keeper	49.58	0.83	$ 34.21	5.78	$ 239.45
S-2 Cash Collection Agent	25.87	0.43	$ 17.85	3.02	$ 124.94
Disbursing Officer	83.84	1.40	$ 84.75	9.78	$ 593.24
Hotel Services Officer	6.09	0.10	$ 7.66	0.71	$ 53.60
Supply Officer	6.04	0.10	$ 9.99	0.71	$ 69.91
Executive Officer	8.90	0.15	$ 17.09	1.04	$ 119.60
Officers	4,141.75	69.03	$ 5,318.81	483.20	$ 37,231.70
Representatives	1,053.96	17.57	$ 1,326.22	122.96	$ 9,283.53
Totals	8,707.74	145.13	$ 9,544.21	1,015.90	$ 66,809.48

(2)   Monthly/Deployment Cost

Multiplying the monthly time in hours of each position by the appropriate hourly rate (Table 4) calculates the monthly cost. For example, the cost of the wardroom officer for this iteration is 12.58 hours multiplied by $75.50 for an approximate monthly cost of $950. The deployment cost was the monthly cost multiplied by seven. This method of calculation holds true for each of the positions' costs, with the exception of the officers.

As mentioned in the task cost section, officers were calculated exactly like the example in the monthly/yearly cost section of the inport model. The only difference is the amount of officers increased from 162 to 465. For these costs, the officer count by rank (shown in Table 1, in the previous chapter) was used to assign each rank to the appropriate amount of occurrences.

e.   *Crystal Ball Layout of the Underway Officer Mess Bill Collection Model*

Figure 4 is a screenshot of the underway officer mess bill collection model. It includes all of the tables covered in each of the previous sections. As mentioned before, there is a random variable cell for every occurrence of each task in the process so this screenshot does not capture the entire model.

Underway Officer Mess Bill Collection Model

Underway Data					
Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	60	45	75	30
S-5 RK	2	60	45	120	1
S-5 RK	3	60	45	90	1
WARDO	4	60	30	75	1
S-5 RK/S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	456
S-5 RK/Ship's Co	9	3	2	5	162
REPS/Officers	10	3	2	5	294
WARDO/REPS	11	5	4	10	12
WARDO	12	30	15	60	8
S-5 RK	13	15	10	20	4
WARDO	14	15	10	20	1
WARDO	15	15	10	20	1
WARDO	16	5	2	15	5
WARDO	17	5	2	10	1
WARDO/S-2 CCA	18	30	10	60	1
DISBO	19	60	45	180	1
WARDO	20	120	90	240	1
DISBO/WARDO	21	5	3	10	1
HSO/WARDO	22	5	3	10	1
SUPPO/WARDO	23	5	3	15	1
XO/WARDO	24	5	3	15	1
WARDO	25	5	4	15	1

Rank	Hourly Rate
RDML	$ 126.72
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.05
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

Random Variables	
Task	Time
1	58.75
1	69.33
1	56.20
1	61.72
1	57.82
1	63.19
1	64.27
1	61.58
1	59.73
1	60.55
1	63.72
1	53.73
1	53.59
1	61.52
1	62.92
1	63.99
1	60.53
1	53.39
1	66.16
1	63.81
1	56.25
1	57.88
1	46.75
1	53.62
1	63.05
1	59.82
1	57.70
1	66.00
1	51.23
1	54.30
2	94.69
3	50.57
4	59.14
5	49.58
6	15.24
7	94.82
8	6.59
8	7.10
8	6.67

Underway Task Calculations		
Task #	Task Time (mins)	Task Cost
1	1,777.20	$ 1,226.21
2	94.69	$ 65.33
3	50.57	$ 34.89
4	59.14	$ 74.42
5	49.58	$ 68.41
6	15.24	$ 19.18
7	94.82	$ 106.73
8	2,624.00	$ 1,397.32
9	538.75	$ 1,045.71
10	979.00	$ 2,479.40
11	74.96	$ 188.65
12	263.13	$ 331.10
13	66.31	$ 45.75
14	12.85	$ 16.17
15	15.70	$ 19.76
16	32.54	$ 40.94
17	4.50	$ 5.66
18	25.87	$ 50.40
19	78.94	$ 79.79
20	131.04	$ 164.88
21	4.91	$ 11.13
22	6.09	$ 15.31
23	6.04	$ 17.59
24	8.90	$ 28.29
25	8.87	$ 11.17
Total	7,013.64	$ 9,544.21

Underway Positional Calculations					
Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Deployment Time (hrs)	Deployment Cost
Wardroom Officer	754.60	12.58	$ 949.52	88.04	$ 6,646.66
S-5 Records Keeper	2,577.10	42.95	$ 1,778.12	300.66	$ 12,446.83
S-2 Records Keeper	49.58	0.83	$ 34.21	5.78	$ 239.45
S-2 Cash Collection Agent	25.87	0.43	$ 17.85	3.02	$ 124.94
Disbursing Officer	83.84	1.40	$ 84.75	9.78	$ 593.24
Hotel Services Officer	6.09	0.10	$ 7.66	0.71	$ 53.60
Supply Officer	6.04	0.10	$ 9.99	0.71	$ 69.91
Executive Officer	8.90	0.15	$ 17.09	1.04	$ 119.60
Officers	4,141.75	69.03	$ 5,318.81	483.20	$ 37,231.70
Representatives	1,053.96	17.57	$ 1,326.22	122.96	$ 9,283.53
Totals	8,707.74	145.13	$ 9,544.21	1,015.90	$ 66,809.48

Figure 4.   Crystal Ball Layout of Underway Officer Mess Bill Collection Model

f.   *Assumptions Utilized for the Underway Mess Bill Collection Model*

- Working hours underway are 40 hours a week.

- There are 30 working days a month underway.

- CVN is underway for the entirety of month for monthly calculations.

- CVN is underway for the entirety of seven months for deployment calculations.

- Task 16 will have five occurrences a month.

- No personnel changes or promotions for the positions involved with the process throughout the year.

- All representatives involved in underway process are the rank of Lieutenant.

- Every officer will load his or her Navy Cash Card once a month to pay his or her mess bill.

- All tasks only account for actual time doing the task.

- Task 8 accounts for transit time to load Navy Cash Cards.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. ANALYSIS

This section provides the analysis of the officer mess bill collection process to determine whether the policy governing this process requires change. We will analyze results from the inport model, analyze results from the underway model, and make a comparison of the two processes. The inport and underway models discussed in the methodology section assigned man-hours and costs to the process. We ran 50,000 iterations of each model utilizing Crystal Ball to provide a clearer picture of man-hours and costs involved in each process. Additionally, all figures are conservative because there is no wait time considered for any of the tasks.

A.   INPORT PROCESS

The inport process involved 23 tasks to complete over the period of two months; however, the completion of all tasks occurs in the period of a month as discussed in the methodology section. This process includes nine positions: wardroom officer, S-5 records keeper, S-2 records keeper, S-2 cash collection agent, disbursing officer, hotel services officer, supply officer, executive officer, and all of ship's company officers (162 on board). Most of these positions play a small role in the inport process. The wardroom officer and S-5 records keeper are the most involved individual positions. The collective involvement of the officers on board is also significant.

After 50,000 iterations, the inport process on average takes 58.18 man-hours to complete a month. This number of man-hours leads to an average cost of $3,631.97 a month. If the ship was inport for a period of a year, then 698.16 man-hours and $43,583.63 would be tied to the collection process. Table 13 contains the summarized data for the inport simulations. Figures 5, 6, 7, and 8 display the simulation results for the monthly time, monthly cost, yearly time, and yearly cost after 50,000 simulations. Each figure includes the mean and 90% confidence interval.

Table 13. Summary of Inport Simulations

Summary of Inport Simulations		
	Mean	**90% Confidence Interval**
Monthly Time (hrs)	58.18	56.25 to 60.22
Yearly Time (hrs)	698.16	675.04 to 722.64
Monthly Cost ($)	3,631.97	3,505.15 to 3,766.11
Yearly Cost (S)	43,583.63	42,061.80 to 45,193.34
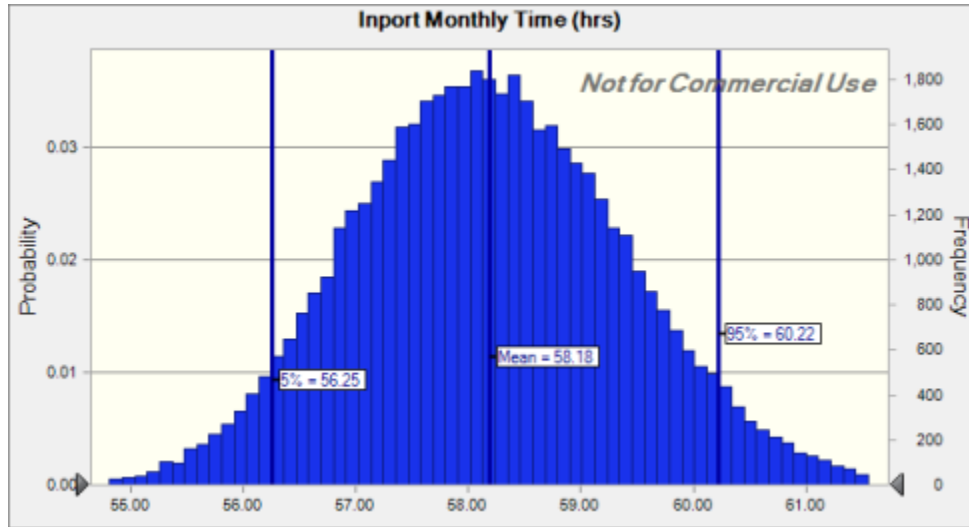
Figure 5. Inport Monthly Estimated Total Time (Hrs)
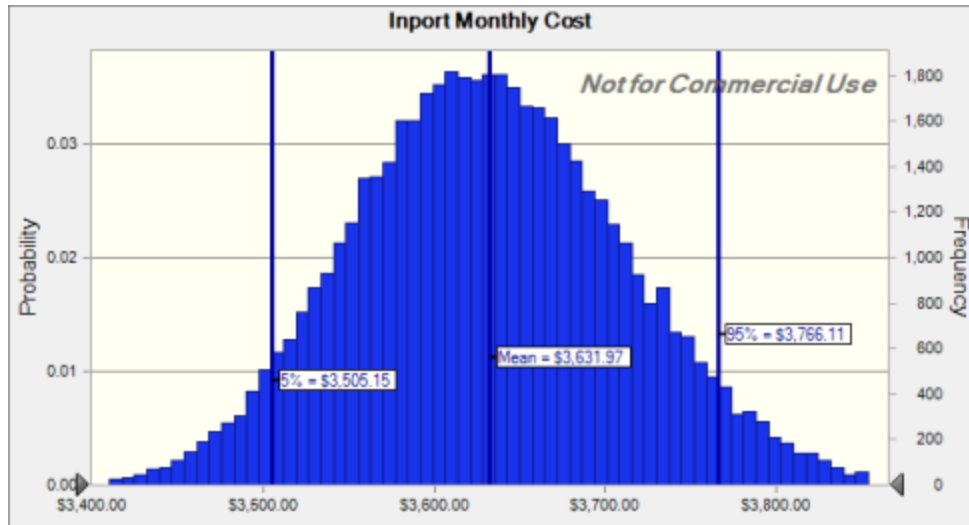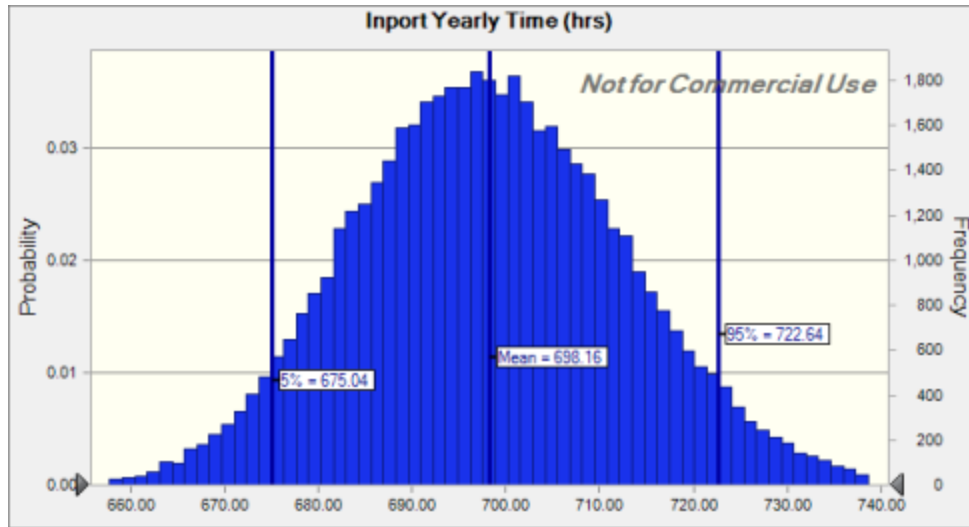

Figure 6. Inport Monthly Estimated Cost ($)

Figure 7. Inport Yearly Estimated Time (Hrs)
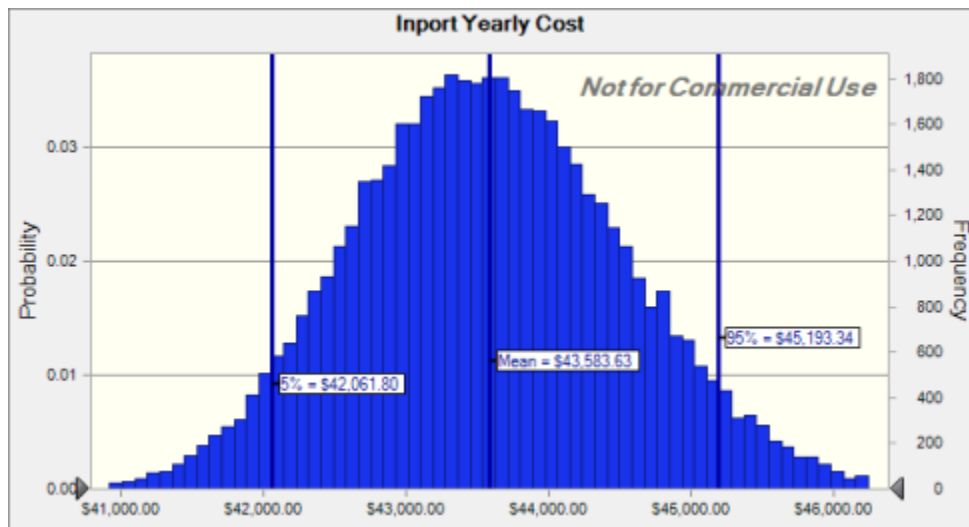
Figure 8. Inport Estimated Yearly Cost ($)

1. Inport Position Cost Drivers

The wardroom officer and S-5 records keeper are tied to the majority of the tasks completed in the process. On average, 10.32 of the 58.18 hours a month involve the wardroom officer, while 20.77 of the 58.18 hours a month involve the S-5 records keeper. Their combined average monthly cost is $1,638.96 and they account for approximately 45 percent of the total cost each month.

Ship's company officers are the major positional cost driver. Although they individually spend a fraction of time involved in the process, their combined involvement is significant. Between 162 officers, they spend an average of 24.30 hours a month in the process at a cost of $1,824.91. The officers combined account for roughly 50 percent of the cost each month. Figure 9 illustrates the positional cost drivers by percentage on a monthly basis.
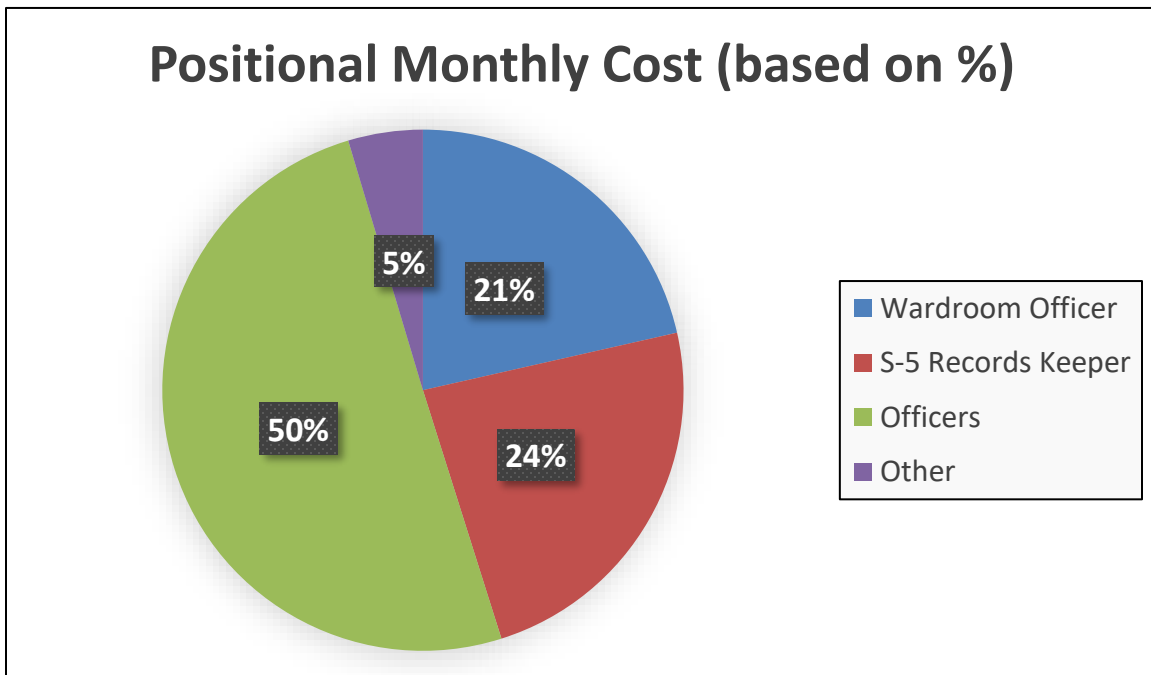
Figure 9. Inport Positional Cost Drivers Monthly Cost (%)

2. Inport Task Cost Drivers

Tasks 8 and 9 (refer to Table 2) drive the cost of the process. Task 8 involves all the officers on the ship loading their cash cards for their monthly payment. It costs $1,149.10 a month on average and makes up approximately 32 percent of the overall cost for the process.

Task 9 involves all of the officers and the S-5 records keeper. The records keeper takes the payment from each officer. This task costs $1,048.40 a month on average and makes up approximately 29 percent of the overall cost for the process. Figure 10 illustrates the task cost drivers by percentage on a monthly basis.
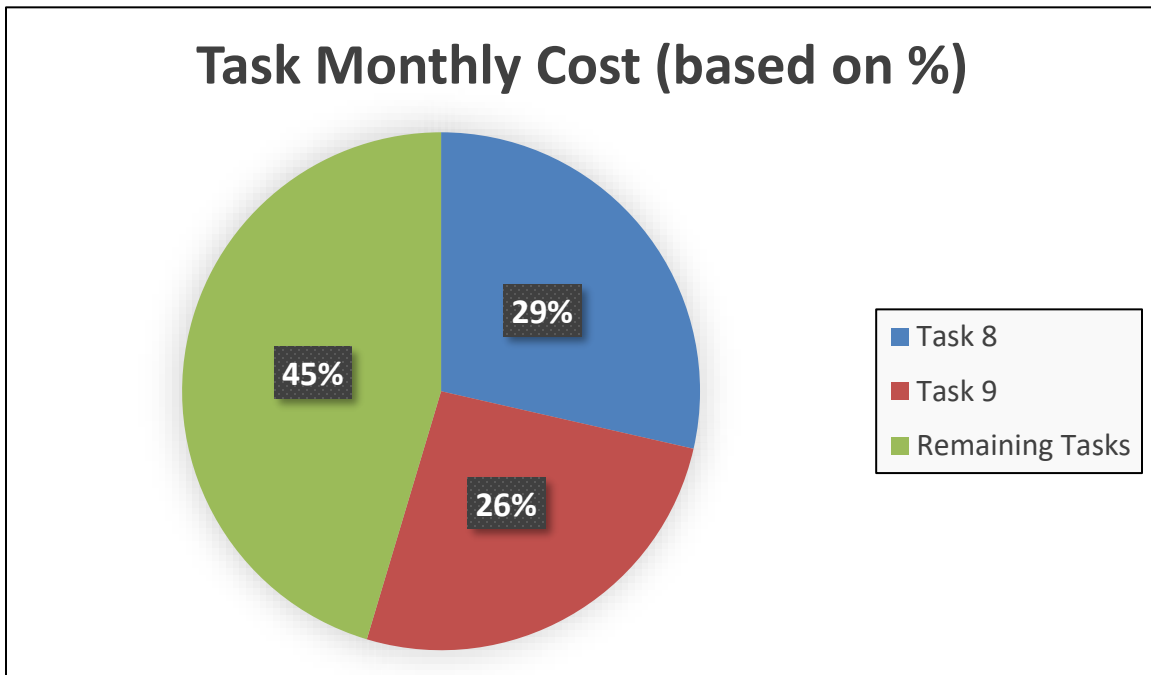
Figure 10. Inport Task Cost Drivers Monthly Cost (%)

B. UNDERWAY PROCESS ANALYSIS

The underway process involves 25 tasks to complete over the period of two months; however, the completion of all tasks occurs in the period of a month as discussed in the methodology section. This process includes ten positions: wardroom officer, S-5 records keeper, S-2 records keeper, S-2 cash collection agent, disbursing officer, hotel services officer, supply officer, executive officer, unit representatives, and all officers embarked in the Strike Group (456 on board). Like the inport process, the wardroom officer and S-5 records keeper are the most involved individual positions. The collective involvement of the unit representatives and officers on board also have significant roles in the process.

After 50,000 iterations, the underway process on average takes 144.75 man-hours to complete a month. This estimate leads to an average cost of $9,513.74 a month. Given that a ship deploys for an average of seven months, 1,013.27 man-hours and $66,596.17 would be tied to the collection process. Table 14 contains the summarized data for the underway simulations. Figures 11, 12, 13, and 14 display the simulation results for the monthly time, monthly cost, deployment time, and deployment cost after 50,000 simulations. Each chart includes the mean and 90% confidence interval.

Table 14.   Summary of Underway Simulations

Summary of Underway Simulations		
	Mean	90% Confidence Interval
Monthly Time (hrs)	144.75	141.96 to 147.59
Seven Month Deployment Time (hrs)	1,013.27	993.74 to 1,033.12
Monthly Cost ($)	9,513.74	9,314.23 to 9,715.41
Seven Month Deployment Cost (S)	66,596.17	65,199.59 to 68,007.84
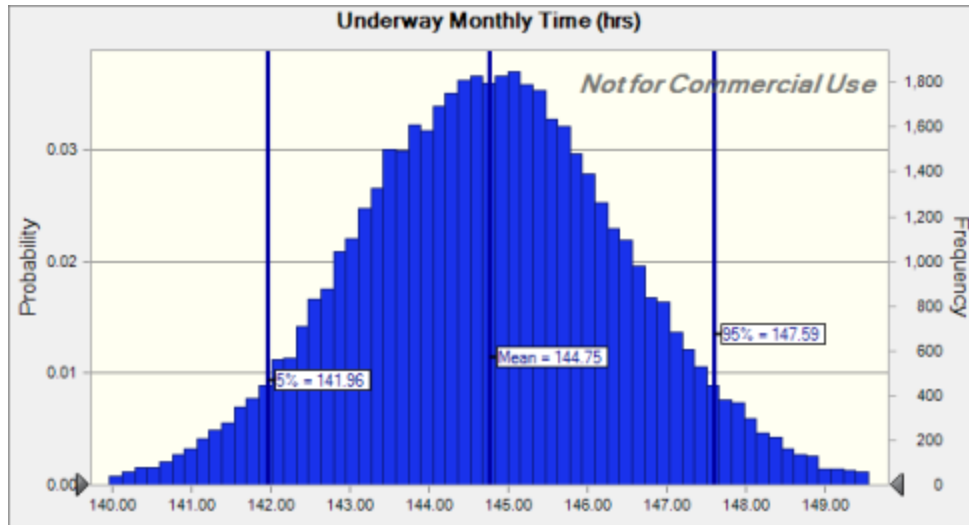
Figure 11. Underway Estimated Monthly Time (Hrs)
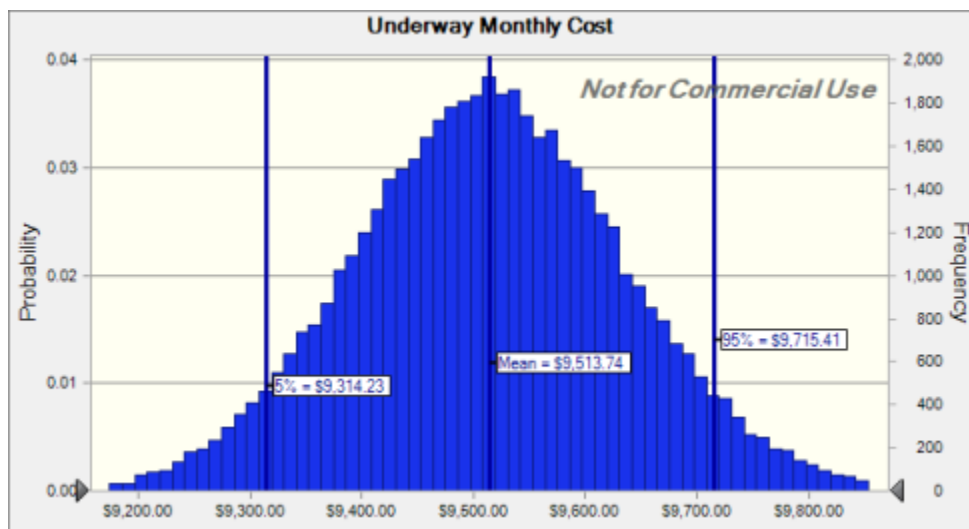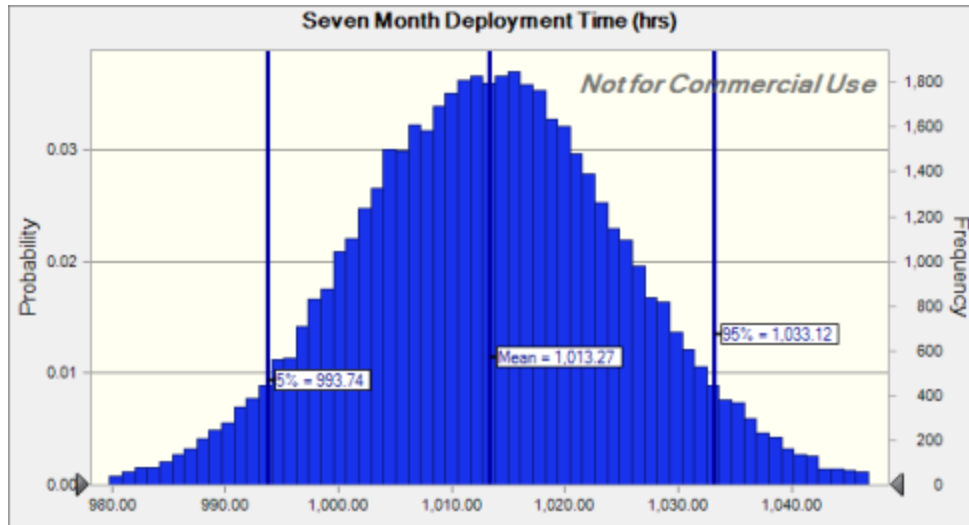

Figure 12. Underway Estimated Monthly Cost ($)
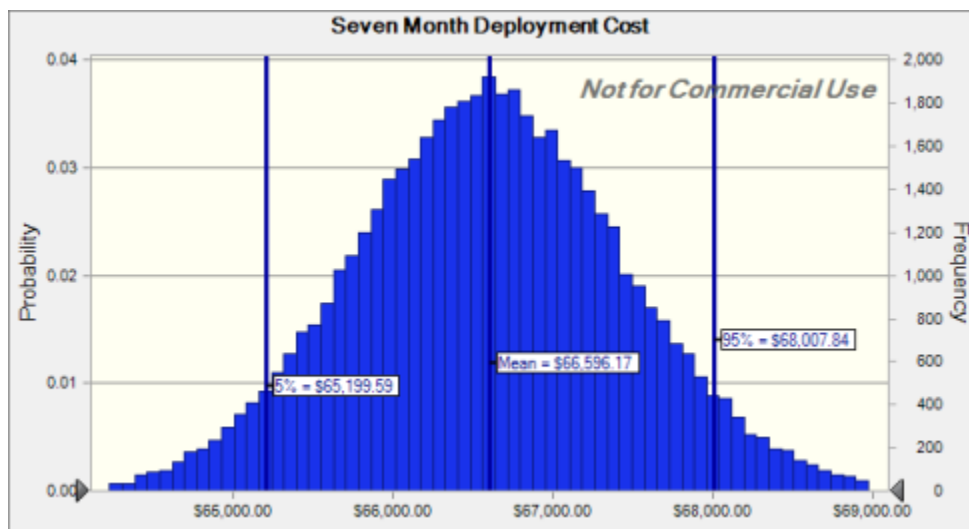
Figure 13. Seven-Month Deployment Estimated Time (Hrs)

Figure 14. Seven-Month Deployment Estimated Cost ($)

1. Underway Position Cost Drivers

The wardroom officer and S-5 records keeper are involved with the majority of the tasks in the process, but they are not as much of a cost driver as in the inport process. On average, 12.86 of 144.75 hours a month involve the wardroom officer while 42.81 of 144.75 hours a month involve the S-5 records keeper. Their combined average monthly cost is $2,744.11 and account for approximately 29 percent of the cost each month.

Unit representatives act as the S-5 records keeper for their respective units while underway. Each representative collects the mess payment from officers in their unit and then makes full unit payment to the wardroom officer. The representatives spend 17.60 hours a month on average performing these tasks at a monthly cost of $1,328.80. They account for around 14 percent of the cost each month.

Again, the major positional cost driver is the officers. The estimated 456 officers spend on average a total of 68.41 hours a month in the process at a cost of $5,261.32. They account for 55 percent of the cost each month. Figure 15 illustrates the positional cost drivers by percentage on a monthly basis.
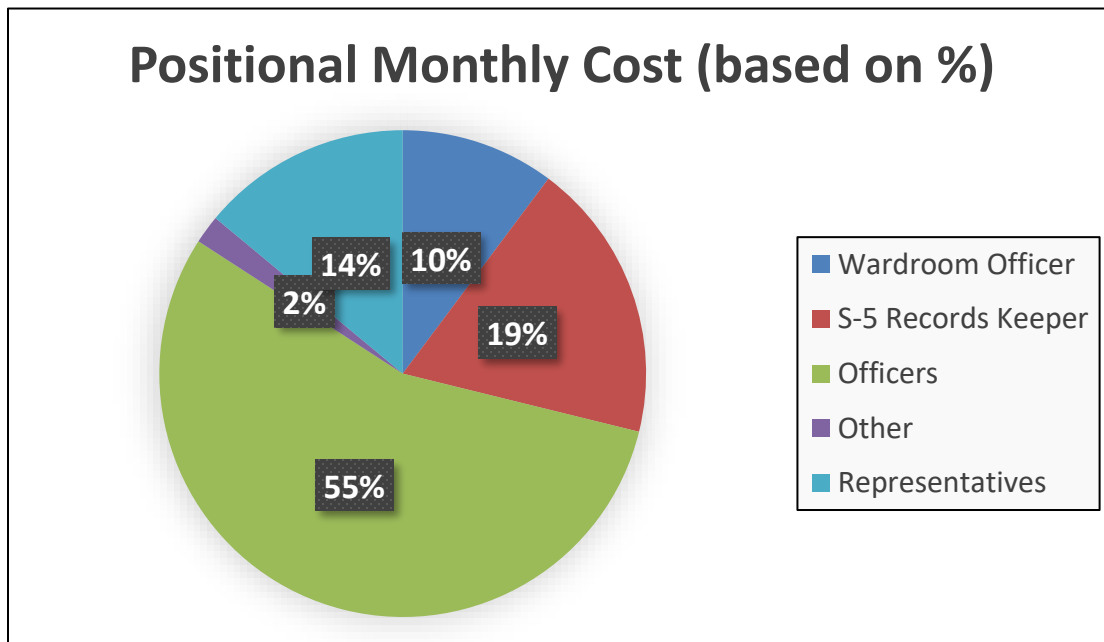

Figure 15. Underway Positional Task Drivers Estimated Monthly Cost (%)

2. Underway Task Cost Drivers

Tasks 1, 8, 9, and 10 (refer to Table 3) drive the cost of the underway process. Task 1 only involves the S-5 records keeper. The task involves entering the meals for all 456 officers into the FSM system each day of the month. It costs $1,242.05 a month on average and accounts for 13 percent of the overall cost of the process.

Task 8 involves all the officers on the ship loading their cash cards for their monthly payment. It costs $3,312.18 a month on average and accounts for approximately 35 percent of the overall cost for the process.

Task 9 involves all the ship's company officers (162 officers) and the S-5 records keeper. The records keeper collects payment from each officer. This task costs $1,048.51 a month on average and accounts for approximately 11 percent of the overall process cost.

Lastly, Task 10 involves all of the remaining officers embarked (294 officers) and 12 unit representatives. As discussed earlier, each unit representative takes the payment for officers in their unit. The task costs $2,505.80 a month on average and accounts for approximately 26 percent of the overall cost for the process. Figure 16 illustrates the task cost drivers by percentage on a monthly basis.
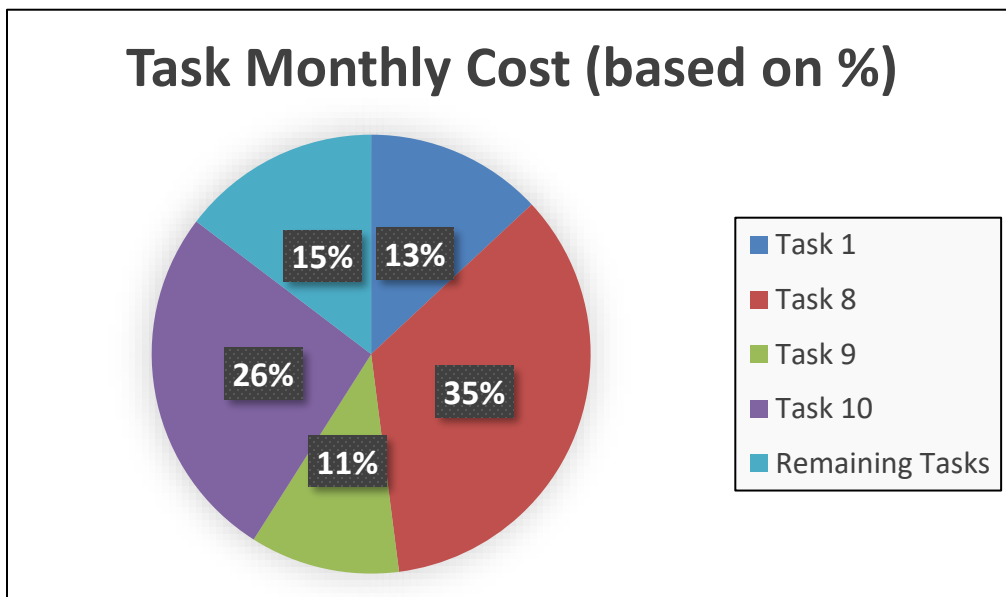

Figure 16. Underway Task Cost Drivers Estimated Monthly Cost (%)

C.   COMPARISON OF THE INPORT AND UNDERWAY ANALYSIS

Utilizing the results of both models, the major cost drivers of both the inport and underway mess bill collection process are the tasks involving all of the officers on the ship. The officers make up 50 and 55 percent of the overall cost for the inport and underway processes, respectively. The tasks including the officers are also the major task cost drivers. The efficiency of this process relies heavily on the officers; thus, to increase efficiency, the solution must address these major cost drivers.

The other major cost drivers include the wardroom officer and S-5 records keeper. The combined cost for these positions make up 45 and 29 percent of the overall cost for the inport and underway processes, respectively. The cost contribution for these positions does not increase for the underway process like that of the officers for two reasons: 1) The wardroom officer only adds one minimal time-consuming task when underway and everything else remains the same. 2) The representatives take responsibility of all of their units, so while the S-5 records keeper's workload increases, it does not increase linearly with the number of officers on board. The remaining positions involved in this process have a marginal contribution to both processes.

THIS PAGE INTENTIONALLY LEFT BLANK

V. RECOMMENDATIONS

Regardless of inport or underway, the officer mess bill collection process on a CVN creates significant man-hours and costs. The ingrained nature of the collection of mess bills in the culture of the wardroom and subsequently in policy makes it easy to overlook these costs. These costs can be reduced or eliminated, and the policy can be changed to parallel the subsistence changes that happened post 2002. Officers now subsist from the general mess and are no longer entitled to special menus and food items. The policy governing and requiring the collection of mess bills is no longer efficient and this study argues that changing the policy to reflect the current situation could save both time and money.

A. AUTOMATIC DEDUCTIONS

The implementation of several different levels of automatic deductions would reduce the man-hours and labor costs for the Navy. First, when an officer checks on board a sea-going unit or deploys as a member of an embarked unit, meal expenses could automatically be deducted from each officer's pay to be paid to the general mess. This method of food payment currently exists for enlisted personnel. Enlisted personnel receive BAS in their paycheck and when stationed on board a ship, has the discounted meal rate automatically deducted from their pay (DoD, 2016). This deduction would be the most difficult policy recommendation to implement. Currently, officers only pay for the meals consumed while inport and with this type of deduction, officers who rarely eat on board while inport would essentially lose their BAS. This policy change would require a significant culture shift and would most likely be met with significant opposition.

A less drastic version of automatic deductions would be to deduct pay only while underway. Underway, food service regulation requires all three meals be charged to officers on board regardless of whether the meals are consumed (NAVSUP, 2016). This method requires officers' meal payment collection to be treated as enlisted meal payment is currently treated. The system already exists to deduct enlisted members pay for meals. This recommendation would be purely administrative in nature so there would be little-to-no cost to the Navy. This option would provide an average savings of 1,013 man-hours and

$66,596.17 in costs over a seven-month deployment that could be applied to mission related activities. With this deduction, the wardroom officer and S-5 records keeper could use this time to improve the service within the wardrooms. This could potentially increase morale for all officers on board that could translate down to their own personnel. In theory, this option would be fairly easy to implement. Furthermore, since Navy regulation requires officers be charged for all three daily meals, little argument can be made in opposition to this policy change recommendation that enforces the existing regulatory requirement.

B.   ALLOTMENTS

Another policy option would be to require officers to set up an allotment to cover their mess bills for deployment. An allotment would be deducted automatically from each officer's personal account and deposited into the wardroom account at the beginning of each month. The disbursing officer would set up the allotments with each officer. While this will require more involvement upfront by each officer and the disbursing officer, it would be a one-time requirement at the beginning of deployment and another simple transaction at the end of deployment to stop the allotment.

While the allotment approach would be an efficient method for deployment, the benefits inport are not as obvious. With the money going to the wardroom account, the wardroom officer would have to provide a refund of unspent funds at the end of each month. Managing this refund would increase the workload of the wardroom officer and the S-5 records keeper inport, which would potentially offset the benefit of not having to collect payments from each officer. Further research would be needed to confirm the estimated time and cost savings with the increase in workload.

C.   SUMMARY

For deployments, both the automatic deduction and allotment recommendations would be a dramatic improvement over the current policy. Both policy options would significantly reduce the monthly man-hours and costs associated with the mess bill collection process. Although not addressed in this study, both policy recommendations would also improve the accountability of over $100,000 collected every month to pay the

general mess for the officer's meals on board a CVN. These policy recommendations are both automated; and thus, significantly reduce human error.

The benefits of these policy recommendations are not as clear for inport periods. For the automatic deduction policy, the officers would have to adjust to a new culture that would require them to pay for all meals regardless of whether eaten or not. While this would save them time each month in the payment of their meals, their meal costs will be higher than with the current policy if they do not eat all meals on board the ship. For the allotment policy, further research would need to be conducted to determine if this method would reduce man-hours over the current policy. Both policy recommendations would improve the accountability of the funds paid to the general mess each month as well as reduce human error.

THIS PAGE INTENTIONALLY LEFT BLANK

VI. CONCLUSION

A. SUMMARY

In the past 20 years, Congress and the Navy implemented changes to BAS and food service management regulations. This project sought to analyze whether or not the current policy requiring the collection of officer mess bills is cost efficient. Through interviewing the personnel most involved in the process on board a CVN, collecting their data relaying the steps of the process and the time consumed per step, we developed models to depict the estimated man-hours and labor costs involved in the current process. The man-hours and costs determined through running 50,000 simulations of the model indicated an estimated total monthly of cost of $3,631 inport and $9,513.74 underway. For the CVN alone that estimate adds up to $43,583.63 inport annually and $66,596.17 underway over a seven-month deployment. Throughout a year, assuming there are two CVNs deployed at any one time and nine CVNs inport we estimate the current mess bill collection policy is costing the Navy approximately $620,000 a year. This cost does not include the rest of the U.S. Navy surface ships who follow the same officer mess bill collection policy and process. If it did, the costs would undoubtedly be significantly higher.

Although we speak mostly to costs, the real loss to the Navy is the man-hours lost executing this policy. Utilizing our recommendations, CVNs and potentially other naval vessels could save hundreds of man-hours each year. Making a change to the officers mess bill collection policy is a win for the Navy and a win for all the people involved with the collection process. While tradition holds strong in the Navy, the updates to BAS and food service management regulations require additional changes that will affect long practiced traditions. The results of this research begin the process to implement the policy changes needed to decrease cost and improve efficiency concerning officer mess bill collection.

B. AREAS FOR FURTHER RESEARCH

Our project focused on one CVN. To gather a more comprehensive data set, the study of the mess bill collection process and the costs associated with conducting this process on board a variety of units could be analyzed. Research outside of the Navy could

be conducted. Perhaps other branches of the military either do not have mess bills, or collect them in a more efficient manner. Costs for mess bill collection do not end on the ship; further costs associated with the process outside of the ship could be analyzed. For instance, looking at the TYCOM, Fleets, and Defense Finance and Accounting Service (DFAS) could provide more insight into the true cost of this process.

Research could extend beyond the process and look more closely at the policy changes that would be required to enact the recommendations we propose, as well as any costs that may be associated with these policy changes. This topic provides a variety of avenues to explore in order to find the best solution to create a more efficient mess bill collection process.

APPENDIX A. INPORT OFFICER MESS BILL COLLECTION MODEL

Inport Officer Mess Bill Collection Model

Inport Data

Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	5	4	10	22
S-5 RK	2	15	10	30	22
S-5 RK	3	60	45	120	1
WARDO	4	60	45	90	1
S-5 RK/S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	162
S-5 RK/Officers	9	3	2	5	162
WARDO	10	30	15	60	6
S-5 RK	11	15	10	20	4
WARDO	12	15	10	20	1
WARDO	13	15	10	20	1
WARDO	14	5	2	15	5
WARDO	15	5	2	10	1
WARDO/S-2 CCA	16	15	5	30	1
DISBO	17	60	45	180	1
WARDO	18	120	90	240	1
DISBO/WARDO	19	5	3	10	1
HSO/WARDO	20	5	3	10	1
SUPPO/WARDO	21	5	3	15	1
XO/WARDO	22	5	3	15	1
WARDO	23	5	4	15	1

Rank	Hourly Rate
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.65
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

Random Variables

Task	Time
1	5.83
1	5.10
1	6.08
1	8.87
1	4.51
1	4.29
1	6.35
1	5.93
1	6.40
1	6.51
1	7.48
1	5.92
1	5.19
1	4.76
1	8.31
1	7.25
1	4.25
1	7.50
1	4.54
1	5.51
1	7.71
1	6.81
2	17.95
2	27.67
2	10.45
2	14.16
2	15.40
2	11.88
2	16.56
2	10.27
2	18.50
2	14.30
2	14.92
2	14.78
2	13.89
2	12.73

Inport Task Calculations

Task #	Task Time (mins)	Task Cost
1	135.09	$ 93.21
2	362.52	$ 250.13
3	96.70	$ 66.72
4	82.37	$ 103.65
5	23.31	$ 32.17
6	15.15	$ 19.06
7	29.07	$ 36.58
8	924.22	$ 1,164.90
9	536.79	$ 1,044.16
10	229.77	$ 289.12
11	54.84	$ 37.84
12	14.16	$ 17.82
13	12.43	$ 15.64
14	44.69	$ 56.24
15	5.63	$ 7.09
16	8.35	$ 16.26
17	66.20	$ 66.91
18	141.82	$ 178.46
19	7.60	$ 17.24
20	5.03	$ 12.65
21	4.80	$ 13.96
22	6.46	$ 20.53
23	5.67	$ 7.14
Total	2812.66	$ 3,567.47

Inport Postional Calculations

Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Yearly Time (hrs)	Yearly Cost
Wardroom Officer	612.99	10.22	$ 771.34	122.60	$ 9,256.06
S-5 Records Keeper	1209.26	20.15	$ 834.35	241.85	$ 10,012.19
S-2 Records Keeper	23.31	0.39	$ 16.09	4.66	$ 193.03
S-2 Cash Collection Agent	8.35	0.14	$ 5.76	1.67	$ 69.10
Disbursing Officer	73.80	1.23	$ 74.59	14.76	$ 895.13
Hotel Services Officer	5.03	0.08	$ 6.33	1.01	$ 75.91
Supply Officer	4.80	0.08	$ 7.93	0.96	$ 95.11
Executive Officer	6.46	0.11	$ 12.40	1.29	$ 148.76
Officers	1461.00	24.35	$ 1,838.70	292.20	$ 22,064.36
Totals	3404.99	56.75	$ 3,567.47	681.00	$ 42,809.66

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B. UNDERWAY OFFICER MESS BILL COLLECTION MODEL

Underway Officer Mess Bill Collection Model

Underway Data

Position	Task #	Mean	Min	Max	Occurrences
S-5 RK	1	60	45	75	30
S-5 RK	2	60	45	120	1
S-5 RK	3	60	45	90	1
WARDO	4	60	30	75	1
S-5 RK /S-2 RK	5	15	10	60	1
WARDO	6	15	10	20	1
WARDO	7	30	15	120	1
Officers	8	5	2	10	456
S-5 RK/Ship's Co	9	3	2	5	162
REPS/Officers	10	3	2	5	294
WARDO/REPS	11	5	4	10	12
WARDO	12	30	15	60	8
S-5 RK	13	15	10	20	4
WARDO	14	15	10	20	1
WARDO	15	15	10	20	1
WARDO	16	5	2	15	5
WARDO	17	5	2	10	1
WARDO/S-2 CCA	18	30	10	60	1
DISBO	19	60	45	180	1
WARDO	20	120	90	240	1
DISBO/WARDO	21	5	3	10	1
HSO/WARDO	22	5	3	10	1
SUPPO/WARDO	23	5	3	15	1
XO/WARDO	24	5	3	15	1
WARDO	25	5	4	15	1

Rank	Hourly Rate
RDML	$ 126.72
CAPT	$ 115.13
CDR	$ 99.15
LCDR	$ 87.98
LT	$ 75.50
LTJG	$ 60.05
ENS	$ 48.43
CWO4	$ 84.52
CWO3	$ 75.25
CWO2	$ 66.87
PO5	$ 41.40

Random Variables

Task	Time
1	56.75
1	69.33
1	55.20
1	61.73
1	57.87
1	63.19
1	64.27
1	61.56
1	59.23
1	60.55
1	63.73
1	53.73
1	53.59
1	61.52
1	62.92
1	63.99
1	60.53
1	53.39
1	66.16
1	63.81
1	56.25
1	57.48
1	46.75
1	53.62
1	63.05
1	58.82
1	57.70
1	66.00
1	51.23
1	56.30
2	94.09
3	50.57
4	59.14
5	49.58
6	15.24
7	94.82
8	8.59
8	7.10
8	6.67

Underway Task Calculations

Task #	Task Time (mins)	Task Cost
1	1,777.20	$ 1,226.21
2	94.09	$ 65.33
3	50.57	$ 34.89
4	59.14	$ 74.42
5	49.58	$ 68.41
6	15.24	$ 19.18
7	94.82	$ 106.73
8	2,624.00	$ 3,397.32
9	538.75	$ 1,045.71
10	979.00	$ 2,479.40
11	74.96	$ 188.65
12	263.13	$ 331.10
13	66.31	$ 45.75
14	12.85	$ 16.17
15	15.70	$ 19.76
16	32.54	$ 40.94
17	4.50	$ 5.66
18	25.87	$ 50.40
19	78.94	$ 79.79
20	131.04	$ 164.88
21	4.91	$ 11.13
22	6.09	$ 15.31
23	6.04	$ 17.59
24	8.90	$ 28.29
25	8.87	$ 11.17
Total	7,013.64	$ 9,544.21

Underway Positional Calculations

| Position	Monthly Time (mins)	Monthly Time (hrs)	Monthly Cost	Deployment Time (hrs)	Deployment Cost
Wardroom Officer	754.60	12.58	$ 949.52	88.04	$ 6,646.66
S-5 Records Keeper	2,577.10	42.95	$ 1,778.12	300.66	$ 12,446.83
S-2 Records Keeper	49.58	0.83	$ 34.21	5.78	$ 239.45
S-2 Cash Collection Agent	25.87	0.43	$ 17.85	3.02	$ 124.94
Disbursing Officer	83.84	1.40	$ 84.75	9.78	$ 593.24
Hotel Services Officer	6.09	0.10	$ 7.66	0.71	$ 53.60
Supply Officer	6.04	0.10	$ 9.99	0.71	$ 69.91
Executive Officer	8.90	0.15	$ 17.09	1.04	$ 119.60
Officers	4,141.75	69.03	$ 5,318.81	483.20	$ 37,231.70
Representatives	1,053.96	17.57	$ 1,326.22	122.96	$ 9,293.53
Totals	8,707.74	145.13	$ 9,544.21	1,015.90	$ 66,809.48

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C. INPORT WARDROOM OFFICER ESTIMATED MONTHLY TIME (HRS) AND COST ($)
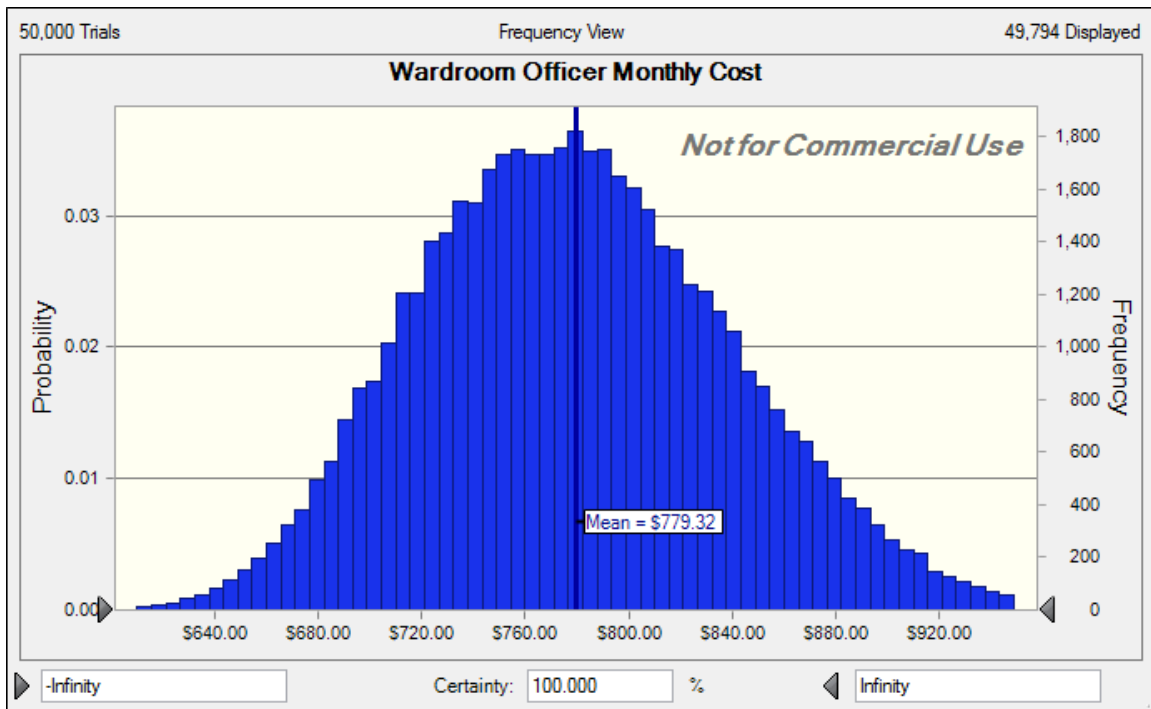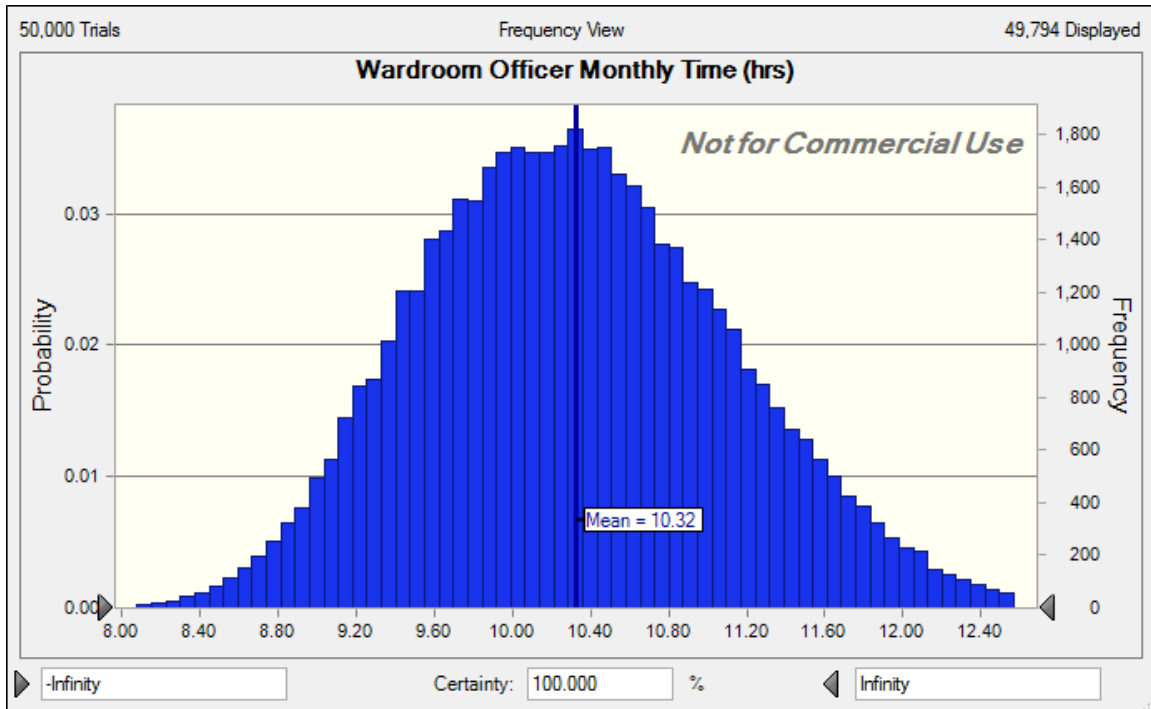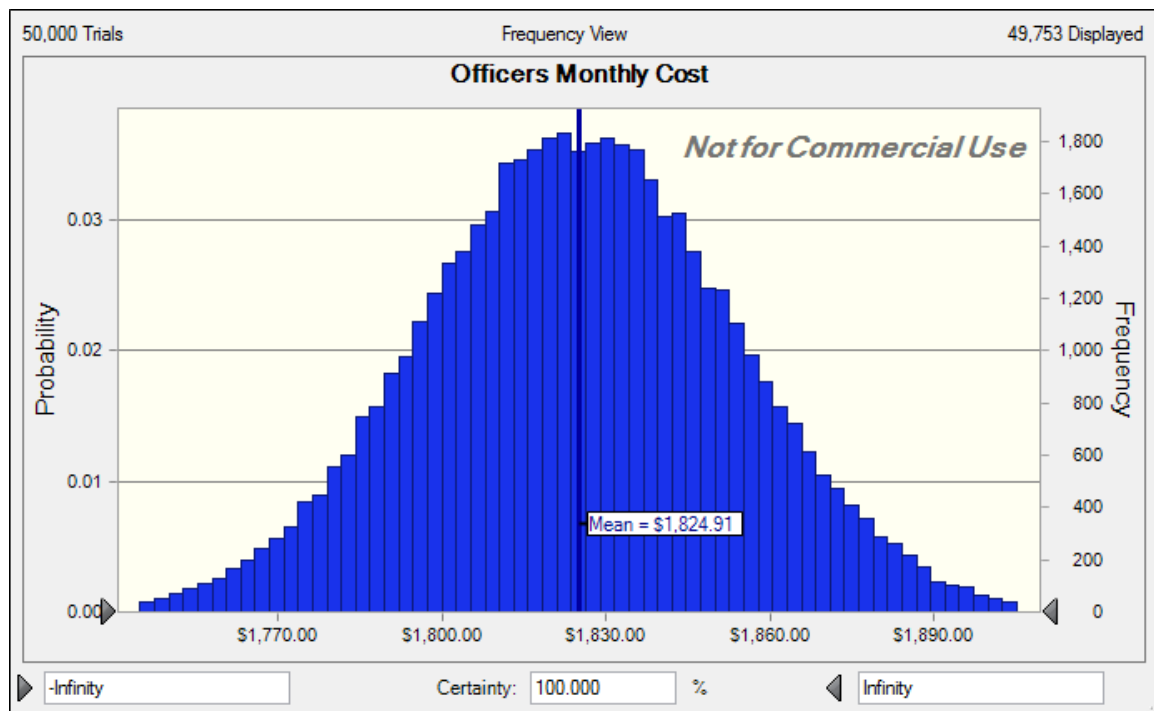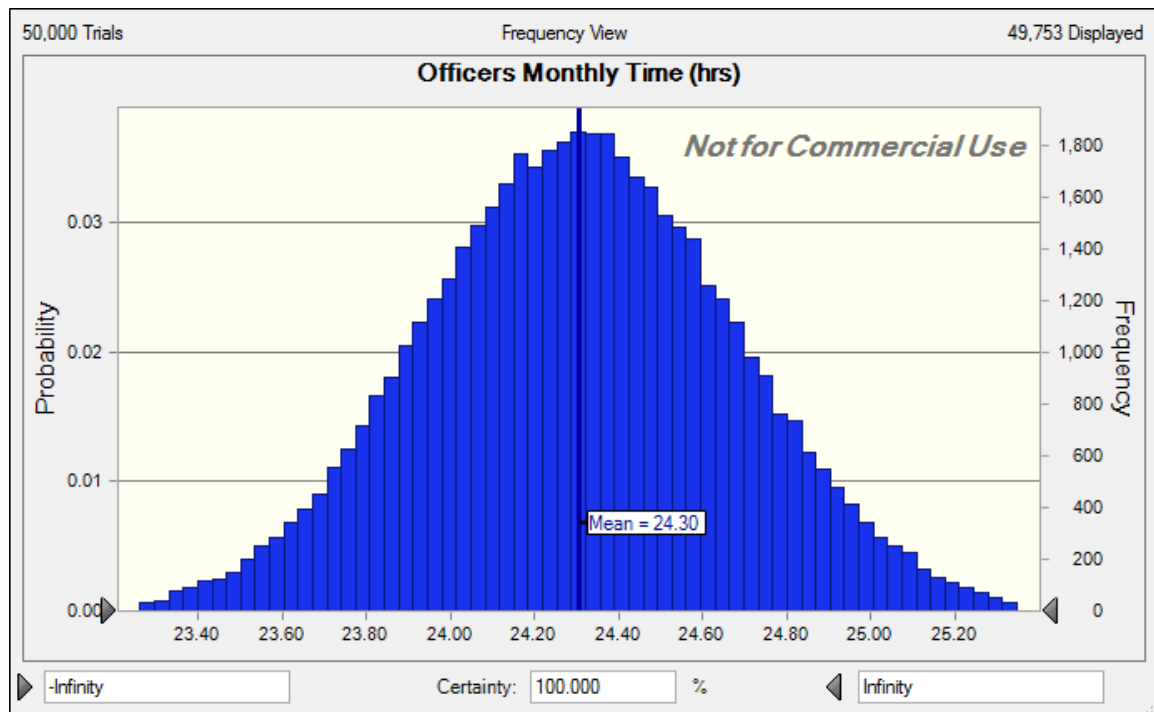
THIS PAGE INTENTIONALLY LEFT BLANK

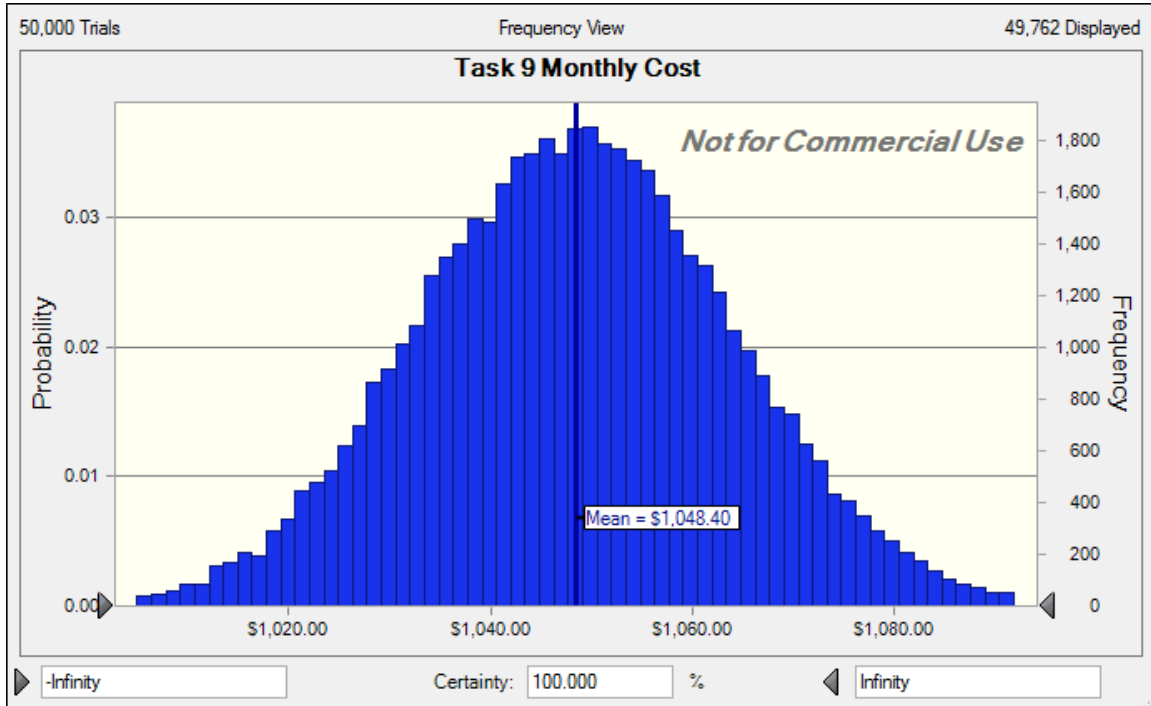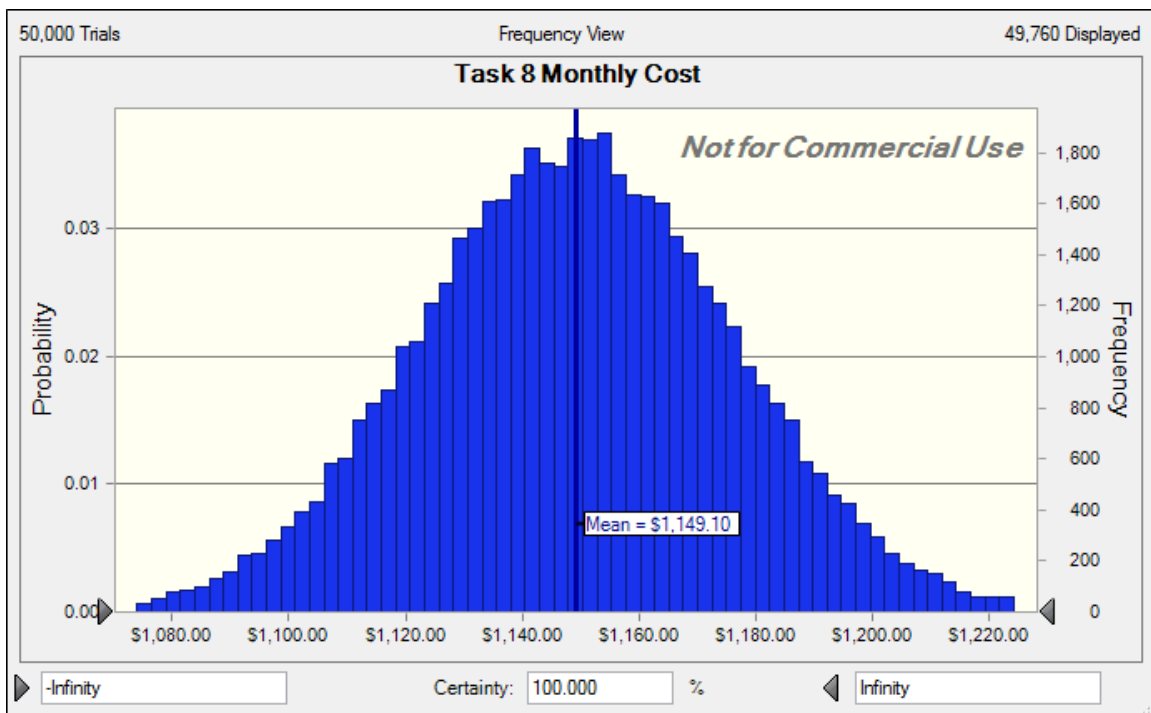# APPENDIX D. INPORT S-5 RECORDS KEEPER ESTIMATED MONTHLY TIME (HRS) AND COST ($)
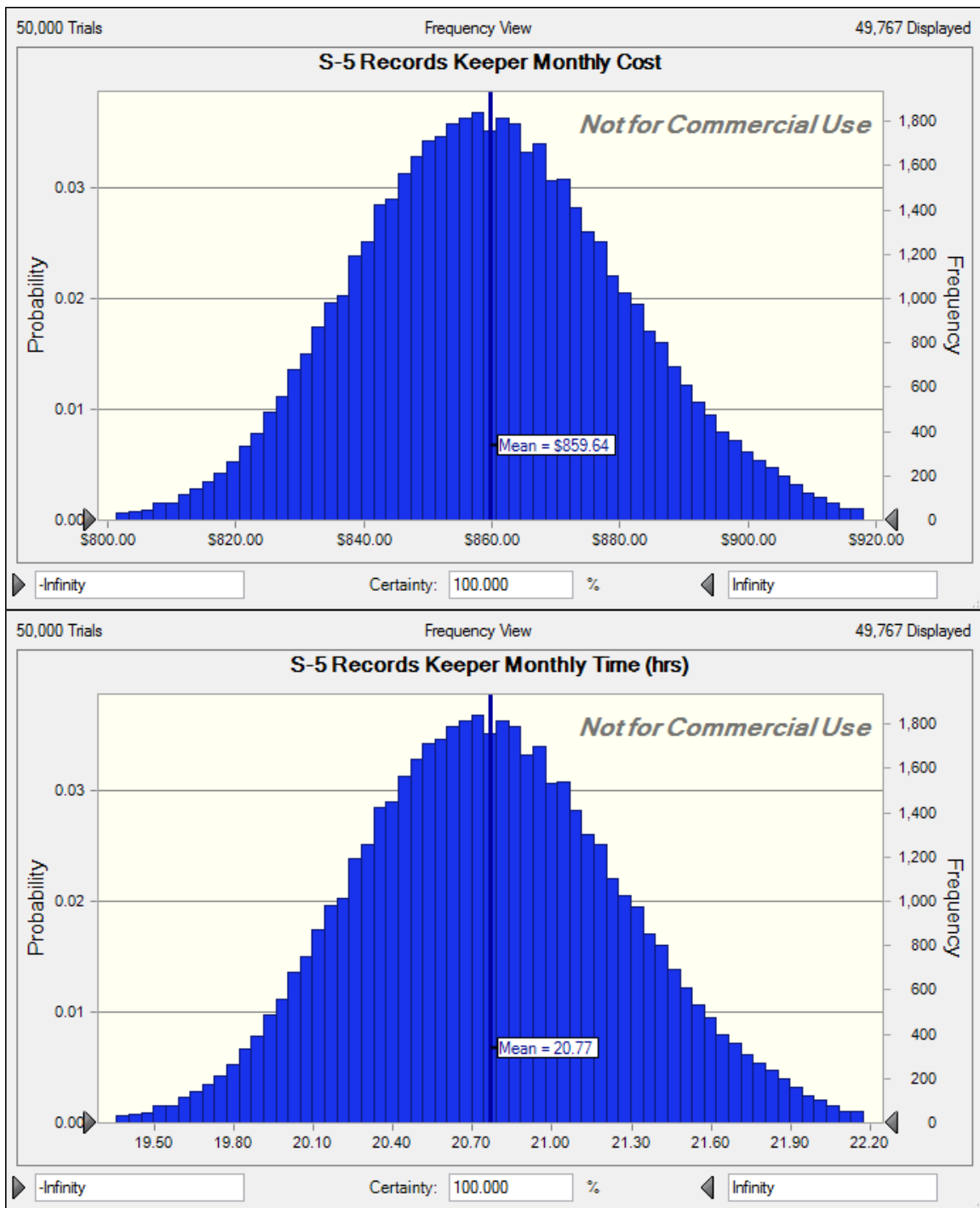
THIS PAGE INTENTIONALLY LEFT BLANK

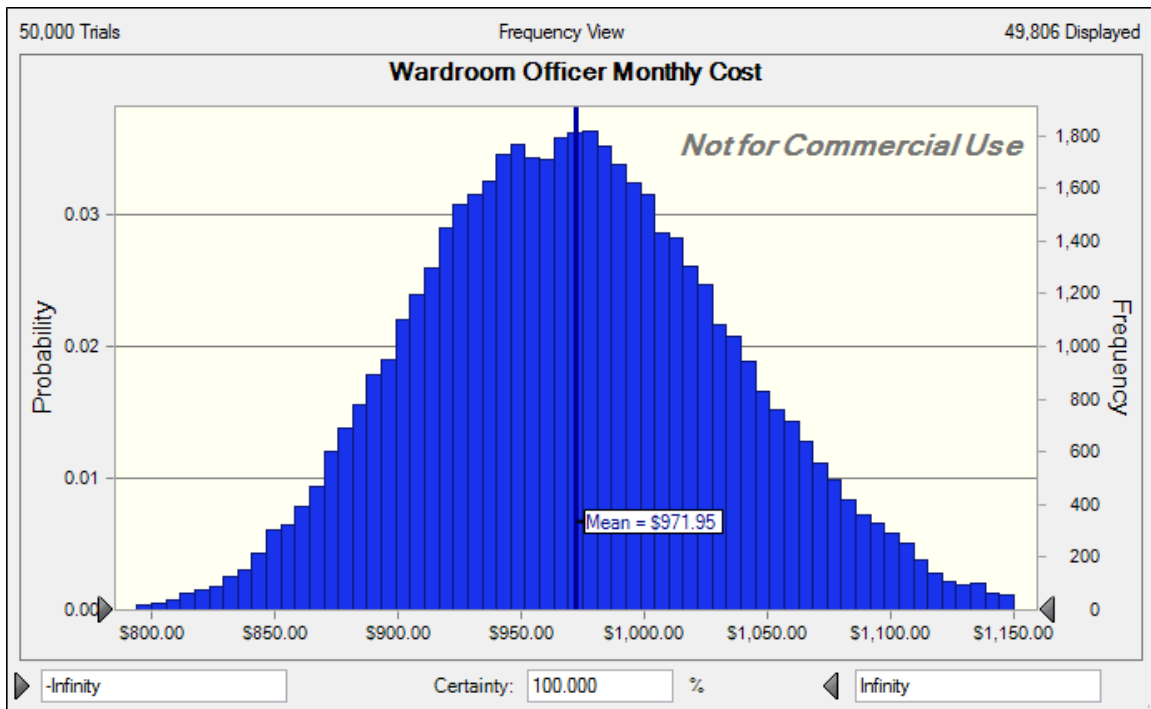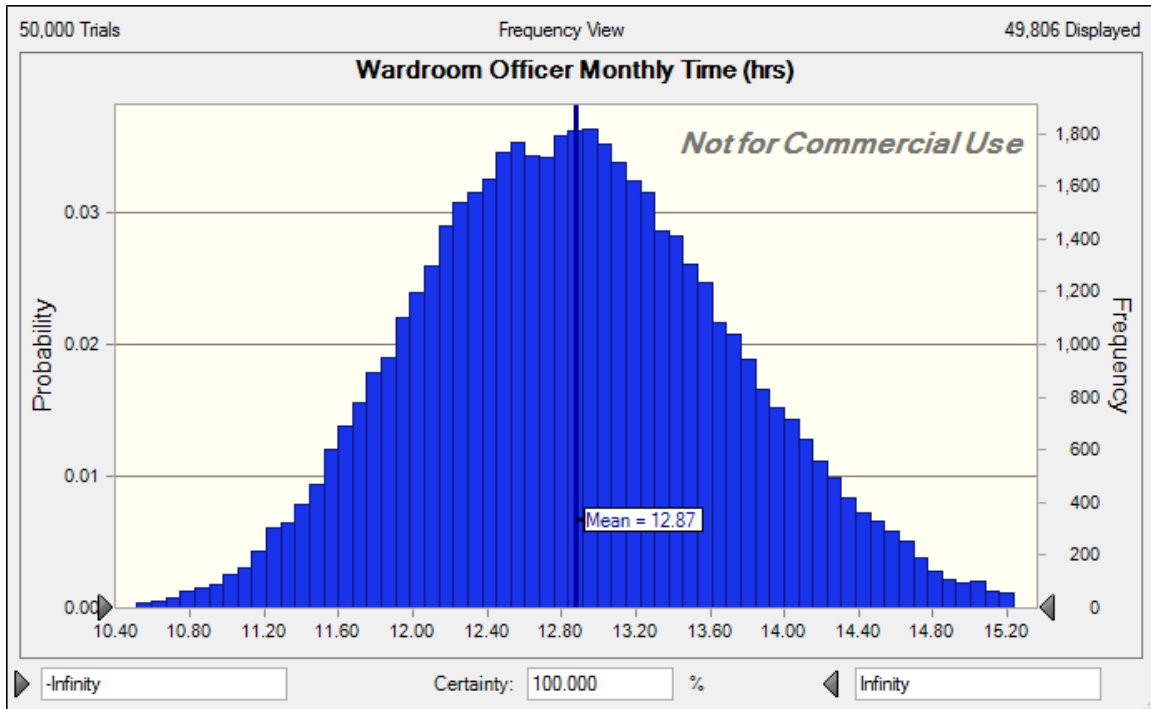# APPENDIX E. INPORT OFFICERS ESTIMATED MONTHLY TIME (HRS) AND COST ($)

THIS PAGE INTENTIONALLY LEFT BLANK

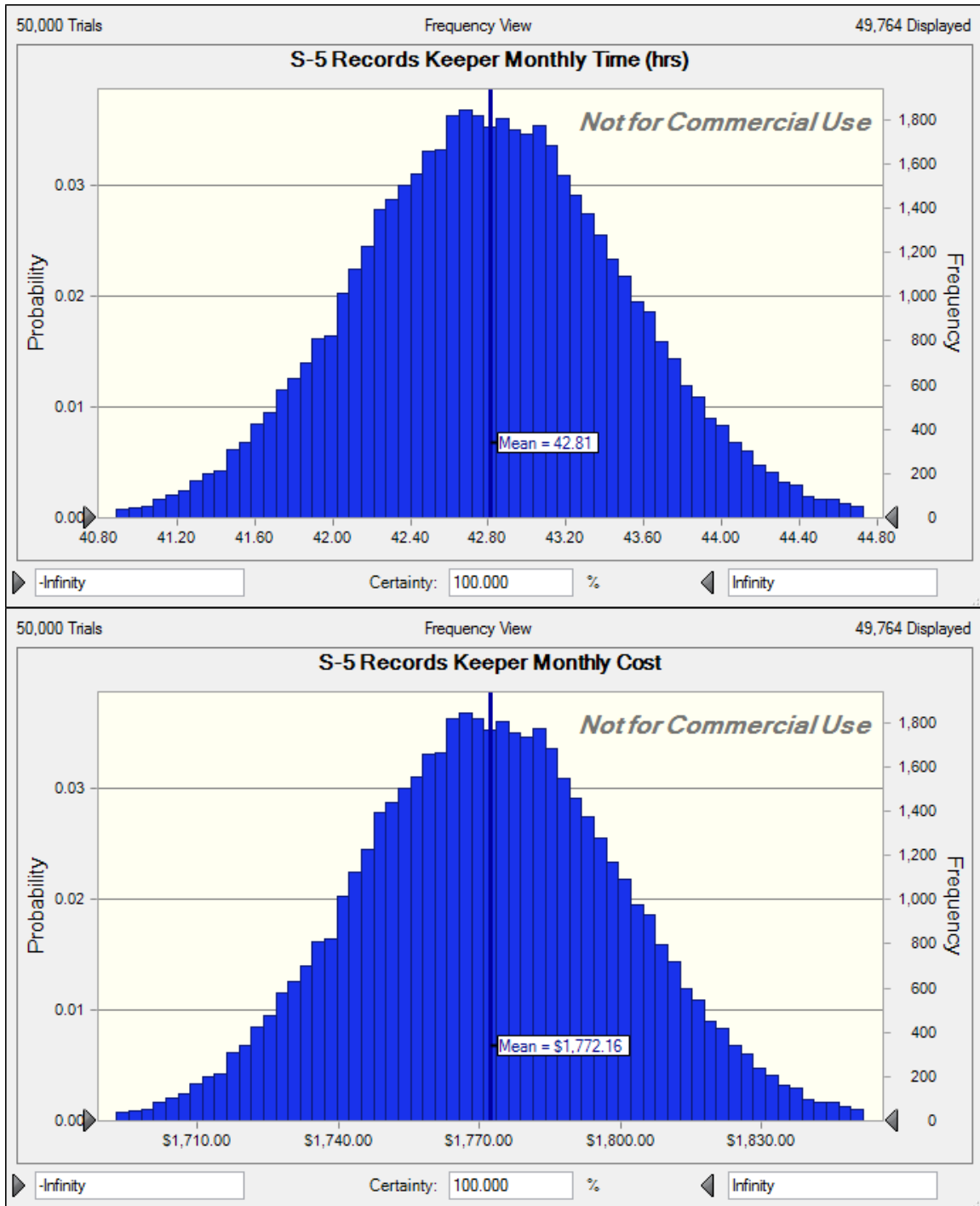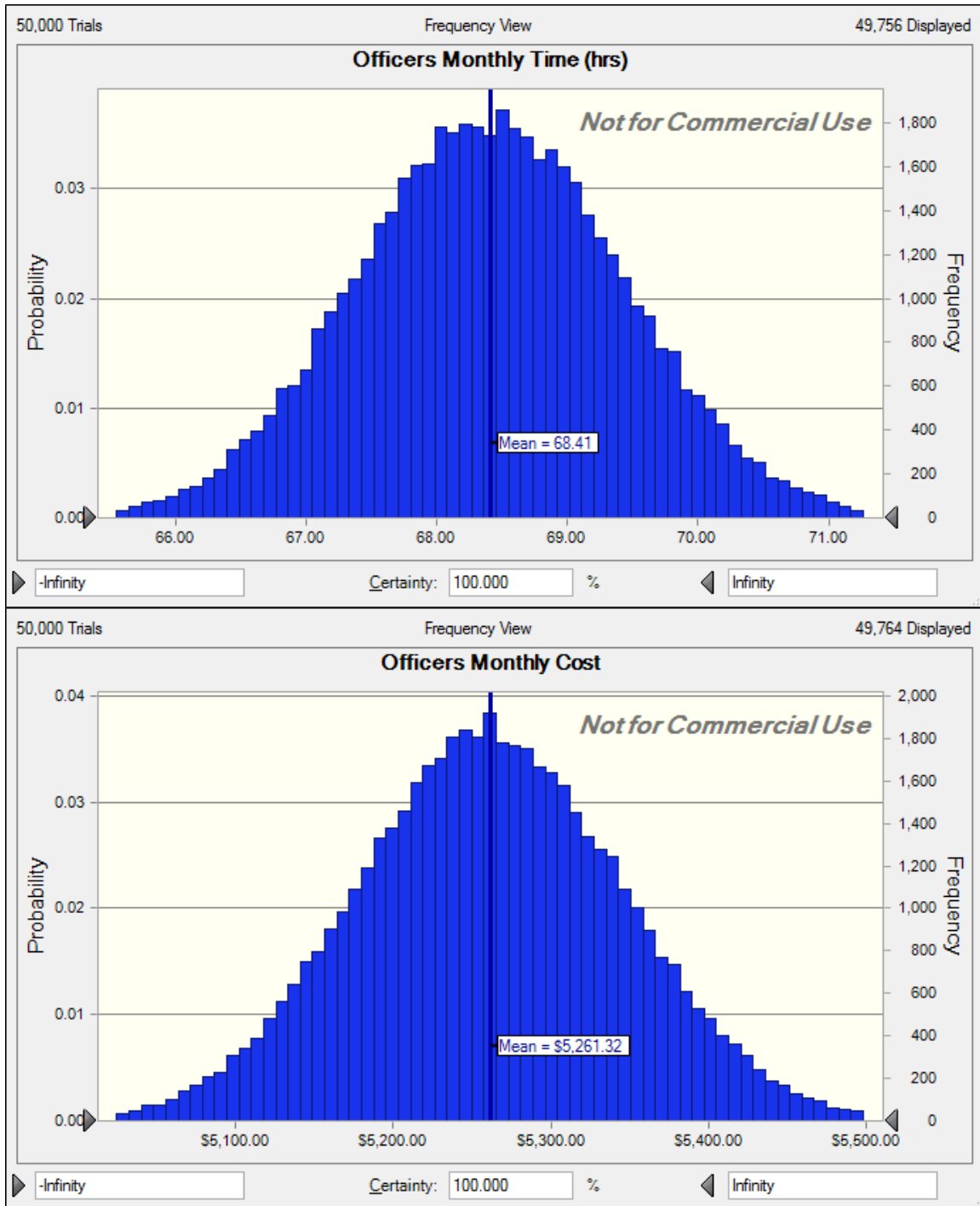# APPENDIX F. INPORT TASK 8 AND TASK 9 MONTHLY COST ($)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX G. WARDROOM OFFICER ESTIMATED MONTHLY TIME (HRS) AND COST ($)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H. S-5 RECORDS KEEPER ESTIMATED MONTHLY TIME (HRS) AND COST ($)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX I. OFFICERS ESTIMATED MONTHLY TIME (HRS) AND COST ($)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX J. REPRESENTATIVES ESTIMATED MONTHLY
TIME (HRS) AND COST ($)
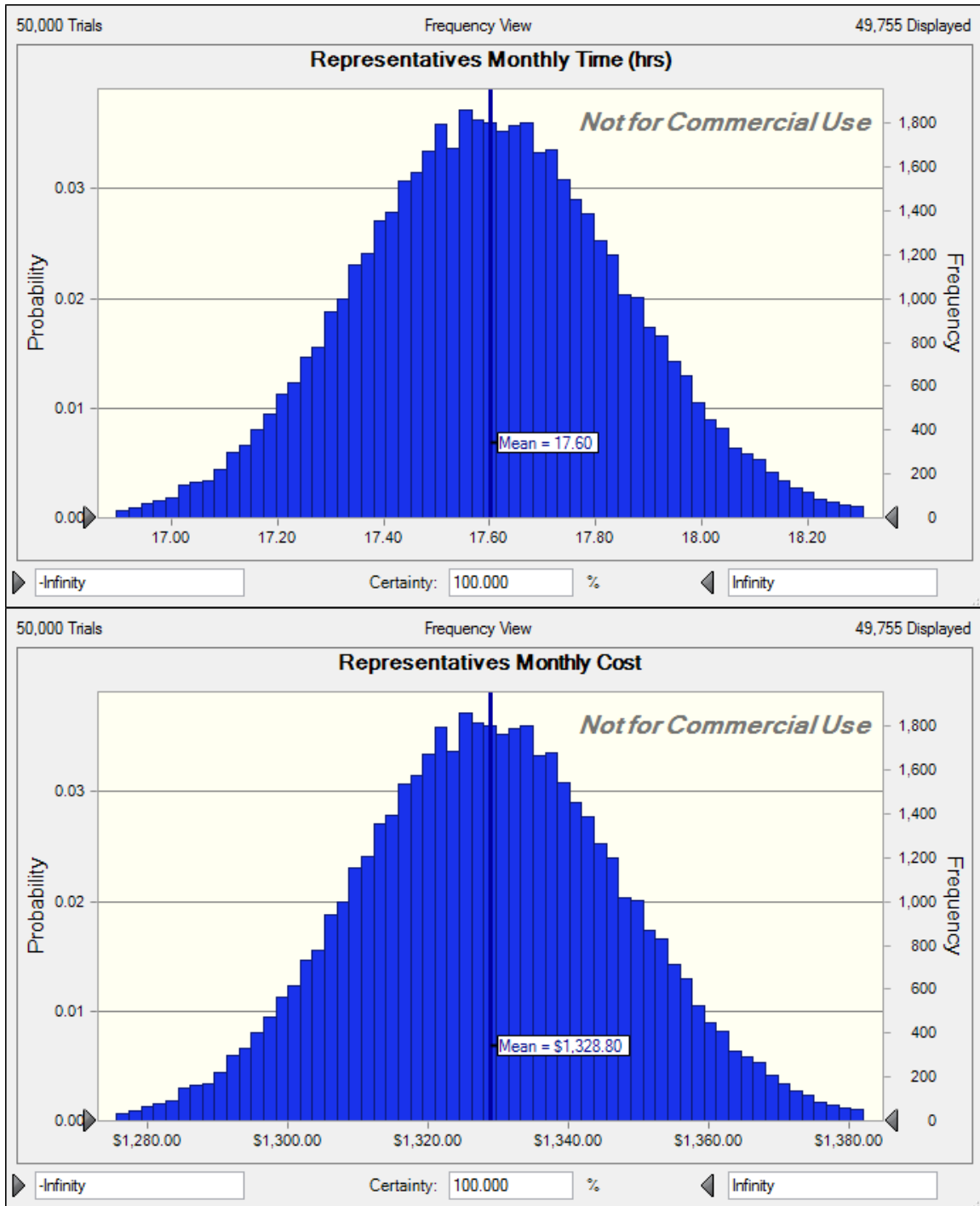
THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX K. TASKS 1, 8, 9, AND 10 ESTIMATED MONTHLY COST ($)
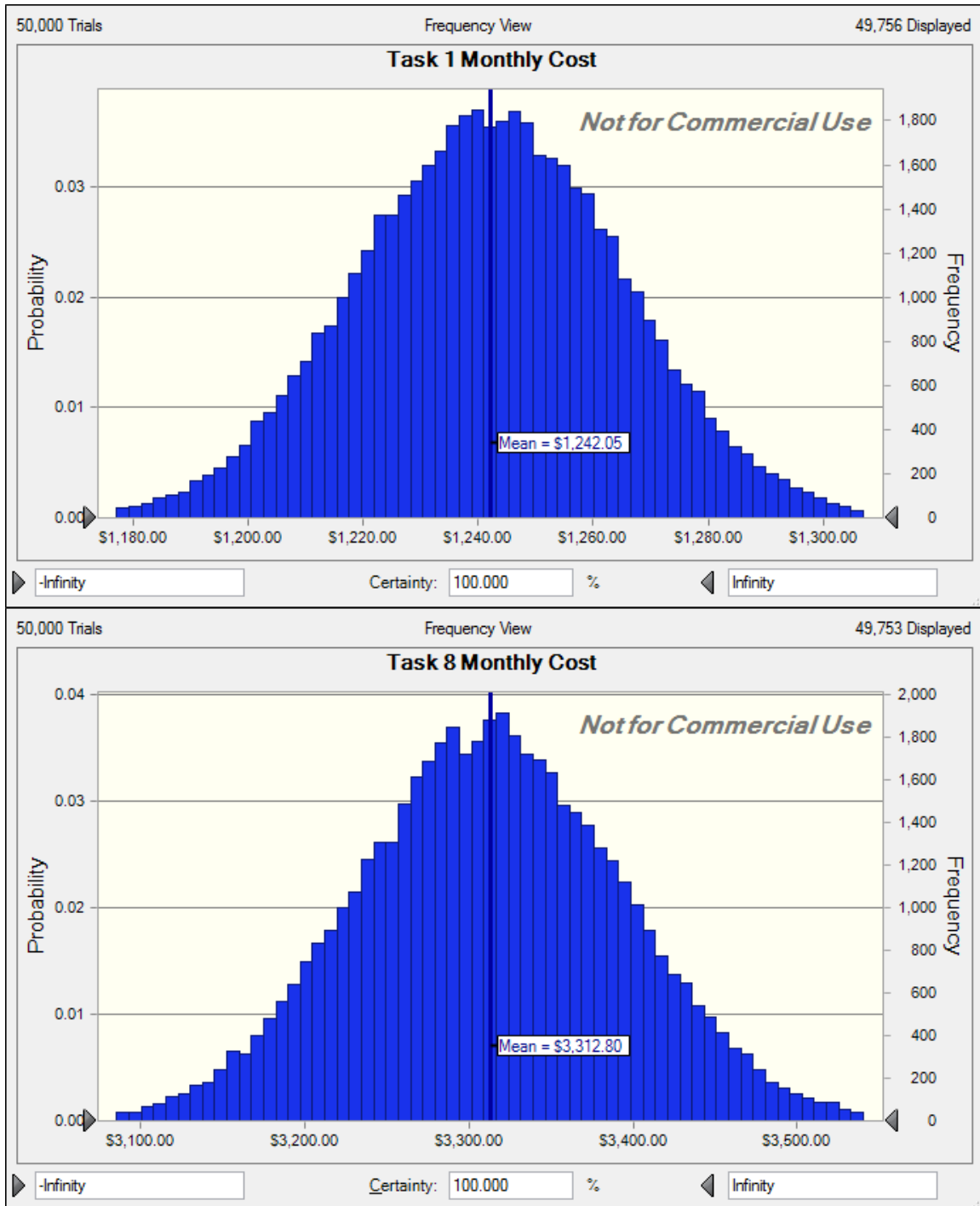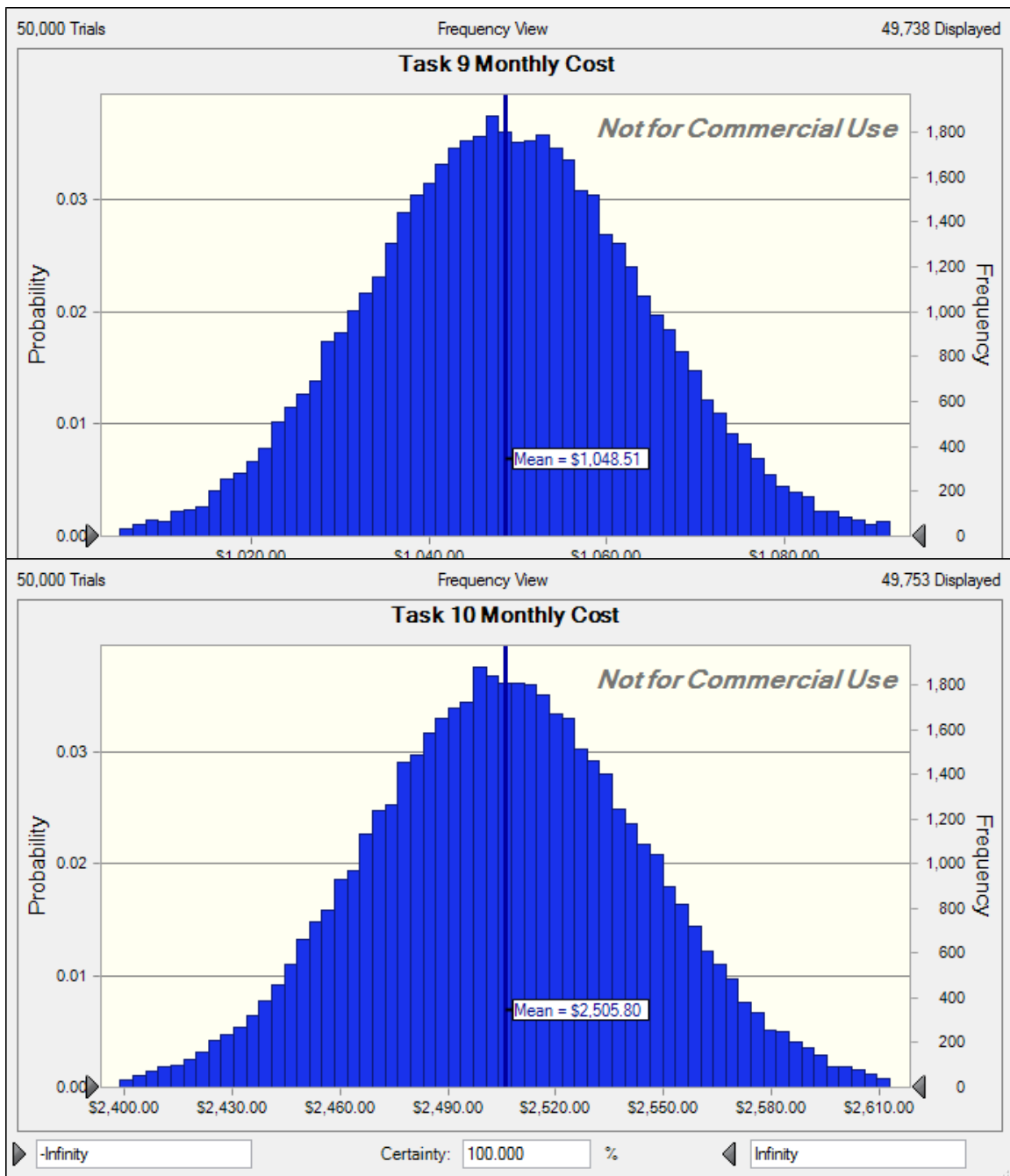
LIST OF REFERENCES

Ageton, A. A. & Mack, W. P. (1960). *The naval officer's guide*. Annapolis, MD: United States Naval Institute.

Bureau of Naval Personnel. (1946, April 18). *Steward's mates.* Washington, DC: United States Government Printing Office. Retrieved from https://ia801404.us. archive.org/25/items/StewardsMates1946/StewardsMates1946.pdf

Bureau of Naval Personnel. (1968, July 03). *The Wardroom* (NavPers 10002-A). Retrieved from https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/w/wardroom-navpers-10002-a.html

Career Compensation Act of 1949. Pub. L. No. 81-351, 63 Stat. 802 (1949). Retrieved from https://babel.hathitrust.org/cgi/pt?id=umn.31951d03584571t;view=1up;seq=3

Curtis, G. (2005). *Military compensation background papers* (6th ed.). Washington, DC: Author. Retrieved from https://www.loc.gov/rr/frd/pdf-files/Military_Comp.pdf

Department of Defense (DoD). (2007, April 23). *Basic allowance for subsistence (BAS) policy* (DOD Directive 1418.05). Washington, DC: Author. Retrieved from http://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/141805p.pdf

Department of Defense (DoD). (2016, April). *Financial management regulation* (DOD Instruction 7000.14-R). Vol. 7A, Chapter 25 "Subsistence Allowances." Washington, DC: Author. Retrieved from http://comptroller.defense.gov/Portals/45/documents/fmr/Volume_07a.pdf

Department of the Navy. (2002, January 9). *Basic allowance for subsistence (BAS)* (NAVADMIN005/02). Washington, DC: Author. Retrieved from http://www.public.navy.mil/bupers-npc/reference/messages/Documents2/NAVADMINS2/NAV2002/nav02005.txt

FederalPay.org. (n.d.). BAH, BAS, and military incentive payscales for 2017. Retrieved November 22, 2017, from https://www.federalpay.org/military/bah-bas

Hosek, J. & Totten, M.E. (2002). *Serving away from home: How deployments influence reenlistment.* Santa Monica, CA: RAND Corporation. Retrieved from: https://www.rand.org/pubs/monograph_reports/MR1594.html

Kapp, L & Torreon, B.S. (2017). *Military pay: Key questions and answers* (CRS Report No. RL33446). Retrieved from Congressional Research Service website: https://fas.org/sgp/crs/natsec/RL33446.pdf

Mack, W.P. & Paulsen, T. D. (1983). *The naval officer's guide 9ᵗʰ Edition*. Annapolis, MD: Naval Institute Press.

Mack, W.P., Seymour, H.A., & McComas, L.A. (1998). *The naval officer's guide 11ᵗʰ Edition.* Annapolis, MD: Naval Institute Press.

Naval Education and Training Program Development Center. (n.d.). Origin of Navy terminology. Retrieved March 31, 2018, from https://www.history.navy.mil/research/library/online-reading-room/title-list-alphabetically/o/origin-navy-terminology.html#war

Navy Department Naval Supply Systems Command. (2007). *Food service management general messes* (NAVSUP Publication 486 Revision of 2007). Mechanicsburg, PA: Author.

Navy Department Naval Supply Systems Command. (2016). *Food service management general messes* (NAVSUP Publication 486 Revision 8). Mechanicsburg, PA: Author.

Pay and Allowances of the Uniformed Services Act, 37 U.S.C. § 402 (2011). Retrieved from http://uscode.house.gov/download/annualhistoricalarchives/pdf/2012/2012usc37.pdf

Philpott, T. (1995). BAS (Basic Allowance for Subsistence) is a mess. *US Naval Institute Proceedings*, *121*(3), 123.

Philpott, T. (1997). Food allowance reform helps some, hurts others. *US Naval Institute Proceedings, 123*(4), 106.

The Naval Officer's Manual. (1951). Harrisburg, PA: The Military Service Publishing Company.

Roth, J. (June 16, 2017). FY 2018 Department of Defense (DoD) Military personnel composite standard pay and reimbursement rates [Memorandum]. Washington, DC: Office of the Under Secretary of Defense. Retrieved from http://comptroller.defense.gov/Portals/45/documents/rates/fy2018/2018_k.pdf

INITIAL DISTRIBUTION LIST

1.   Defense Technical Information Center
        Ft. Belvoir, Virginia

2.   Dudley Knox Library
        Naval Postgraduate School
        Monterey, California